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CURRENT APPOINTMENT

Carnegie Mellon University, Pittsburgh, Pennsylvania

Professor, Department of Engineering and Public Policy and Carnegie Mellon University Africa.

Areas of expertise: Energy systems for global development, life cycle assessment (LCA), sustainability engineering, environmental management decision tools, energy modeling, environmental impacts of energy systems, energy and environmental policy.

PAST APPOINTMENTS

Carnegie Mellon University, Pittsburgh, Pennsylvania

Associate Professor, Department of Engineering and Public Policy.
2016 to 2019

Carnegie Mellon University Africa, Kigali, Rwanda

Visiting Professor
2016 to 2017

Carnegie Mellon University, Pittsburgh, Pennsylvania

Assistant Professor, Department of Engineering and Public Policy.
2013 to 2016

Carnegie Mellon University, Pittsburgh, Pennsylvania

Executive Director, RenewElec Project.
2010 to 2014

Carnegie Mellon University, Pittsburgh, Pennsylvania

Assistant Research Professor, Department of Engineering and Public Policy.
2010 to 2013

Carnegie Mellon University, Pittsburgh, Pennsylvania

Project Engineer, Green Design Institute, Department of Civil and Environmental Engineering.
2008 to 2010

EDUCATION

Carnegie Mellon University, Pittsburgh, Pennsylvania

Ph.D., Civil and Environmental Engineering. December 2007.

Committee: H. Scott Matthews (co-chair), W. Mike Griffin (co-chair), Chris T. Hendrickson, M. Granger Morgan.

Dissertation Title: Life Cycle Comparison of Coal and Natural Gas for Electricity Generation and the Production of Transportation Fuels.

M.S., Civil and Environmental Engineering. December 2004

Florida International University, Miami - Florida

B.S., Civil and Environmental Engineering. May 2003

HONORS AND RECOGNITIONS

- AAAS Science & Technology Policy Legislative Fellow. 2024-2025
- Executive Leadership in Academic Technology, Engineering and Science (ELATES) Fellow. 2023-2024
- Member of the National Academies Roundtable on Macroeconomics and Climate-related Risks and Opportunities. 2022-present
- Coordinating Lead Author for Chapter 10 (Transport) of Working Group III for IPCC's 6th Climate Assessment Report. 2018-2022
- Andrew Carnegie Fellow. Carnegie Corporation of New York. New York. 2020.
- Recipient of the Steve Fenves Award for Systems Research. Pittsburgh, Pennsylvania. 2019.
- Recipient of Arthur Hamerschlag Career Development Professor of Engineering and Public Policy. Pittsburgh, Pennsylvania. May 2018.
- Recipient of the Dean's Early Career Fellowship. Presented by the College of Engineering at Carnegie Mellon University. Pittsburgh, Pennsylvania. May 2016.
- Recipient of The Teresa Heinz Scholars for Environmental Research Ph.D. Grant. 2006-2007.
- Recipient of The Teresa Heinz Scholars for Environmental Research Masters Grant. 2004-2005.
- Outstanding Student Award in Civil Engineering. Spring 2003. Florida International University, Miami-Florida.
- National Dean's List 2002.

PUBLICATIONS

Google Scholar Metrics

Citations: 8,764; h-index¹: 46; i10-index²: 80 (as of December 2023)

Underlining indicates co-author is a student. *Italics* indicate corresponding author.

Peer-Reviewed Journal Articles

1. Jordan, K., Adams, P. J., **Jaramillo, P.** & Muller, N. Z. "Closing the Gap: Achieving U.S. Climate Goals beyond the Inflation Reduction Act." *Renewable and Sustainable Energy Transition* 4: 100065. (2023).
2. Roth, M. B., Adams, P. J., **Jaramillo, P.** & Muller, N. Z. "Policy spillovers, technological lock-in, and efficiency gains from regional pollution taxes in the U.S." *Energy and Climate Change*. **3**, 100077 (2022).
3. Joan Nkiriki, **Jaramillo, P.**, Williams, N., Davis, A., Armanios, D.E. "Estimating global demand for land-based transportation services using a Shared Socioeconomic Pathways framework." *Environmental Research – Infrastructure Sustainability*. **2**, 03509 (2022).
4. Caceres, A. L., **Jaramillo, P.**, Matthews, H. S., Samaras, C. & Nijssen, B., "Potential hydropower contribution to mitigate climate risk and build resilience in Africa." *Nature Climate Change*. **12**, 719-727 (2022).
5. Izgar-Tenorio, J. L., **Jaramillo, P.** & Williams, N., "Techno-economic feasibility of small-scale pressurized irrigation in Ethiopia, Rwanda, and Uganda through an integrated modeling approach." *Environmental Research Letters* **16**, 104048 (2021)
6. Udeani, C., **Jaramillo, P.** & Williams, N. J., "A techno-economic and environmental assessment of residential rooftop solar - Battery systems in grid-connected households in Lagos, Nigeria." *Development Engineering*. **6**, 100069 (2021).

¹ Maximum number h such that h publications have been cited at least h times each

² Number of publications that have been cited at least 10 times

7. Maghfirra, D., Cohon, J. L., **Jaramillo, P.** & Morgan, M. G., “Optimizing an equitable micro-hydropower deployment : Application of a multi-objective method for rural Indonesia.” *Journal of Multi-Criteria Decision Analysis*. 1–12 (2021).
8. Fonseca, F. R., Craig, M., **Jaramillo, P.**, Bergés, M., Severnini, E., Loew, A., Zhai, H., Cheng, Y., Nijssen, B., Voisin, N. & Yearsley, J., “Climate-induced tradeoffs in planning and operating costs of a regional electricity system.” *Environmental Science & Technology*. 55:16, 11204-11215 (2021).
9. Allee, A., Williams, N. J., Davis, A. & **Jaramillo, P.**, “Predicting initial electricity demand in off-grid Tanzanian communities using customer survey data and machine learning models.” *Energy for Sustainable Development*. 62, 56–66 (2021).
10. Caceres, A. L., **Jaramillo, P.**, Matthews, H. S., Samaras, C. & Nijssen, B., “Hydropower under climate uncertainty: Characterizing the usable capacity of Brazilian, Colombian and Peruvian power plants under climate scenarios.” *Energy for Sustainable Development*. 61, 217–229 (2021).
11. Ralston Fonseca, F., Craig, M., **Jaramillo, P.**, Berges, M., Severnini, E., Loew, A., Zhai, H., Cheng, Y., Nijssen, B., Voisin, N. & Yearsley, J., “Effects of climate change on capacity expansion decisions of an electricity generation fleet in the Southeast U.S.” *Environmental Science and Technology*. 55:4, 2522-2531 (2021).
12. DeCarolís, J. F., **Jaramillo, P.**, Johnson, J. X., McCollum, D. L., Trutnevyte, E., Daniels, D. C., Akın-Olçum, G., Bergerson, J., Cho, S., Choi, J.-H., Craig, M. T., de Queiroz, A. R., Eshraghi, H., Galik, C. S., Gutowski, T. G., Haapala, K. R., Hodge, B.-M., Hoque, S., Jenkins, J. D., Jenn, A., Johansson, D. J. A., Kaufman, N., Kiviluoma, J., Lin, Z., MacLean, H. L., Masanet, E., Masnadi, M. S., McMillan, C. A., Nock, D. S., Patankar, N., Patino-Echeverri, D., Schively, G., Siddiqui, S., Smith, A. D., Venkatesh, A., Wagner, G., Yeh, S. & Zhou, Y., “Leveraging Open-Source Tools for Collaborative Macro-energy System Modeling Efforts.” *Joule* (2020).
13. R Subramanian, Kagabo, A. S., Baharane, V., Guhirwa, S., Sindayigaya, C., Malings, C., Williams, N. J., Kalisa, E., Li, H., Adams, P., Robinson, A. L., DeWitt, H. L., Gasore, J. & Jaramillo, P., “Air pollution in Kigali, Rwanda: spatial and temporal variability, source contributions, and the impact of car-free Sundays.” *Clean Air Journal* **30**, (2020).
14. Loew, A., **Jaramillo, P.**, Ali, R., Nijssen, B. & Klima, K. “Fossil fuel-fired power plant operations under a changing climate.” *Climatic Change*. 2020, 163: 619-632.
15. Roth, M. B., Adams, P. J., **Jaramillo, P.** & Muller, N. Z. “Near term carbon tax policy in the U.S. economy: limits to deep decarbonization.” *Environmental Research Communications*. **2**, 51004. 2020.
16. Mangones, S. C., **Jaramillo, P.**, Rojas, N. Y. & Fischbeck, P. “Air pollution emission effects of changes in transport supply: the case of Bogotá, Colombia.” *Environmental Science and Pollution. Research*. 2020, 27 (29): 35971-35978.
17. Izgar-Tenorio, J., **Jaramillo, P.**, Griffin, W. M. & Small, M. “Impacts of projected climate change scenarios on heating and cooling demand for industrial broiler chicken farming in the Eastern U.S.” *Journal of Cleaner Production*. 2020, **255**, 120306.
18. Craig, M. T., **Jaramillo, P.**, Hodge, B.-M., Nijssen, B. & Brancucci, C. “Compounding climate change impacts during high stress periods for a high wind and solar power system in Texas.” *Environmental Research Letters*. 2020, **15**, 024002.
19. Rosenberg, M.; Armanios, D.E.; Aklin, M.; **Jaramillo, P.** “Evidence of gender inequality in energy use from a mixed-methods study in India.” *Nature Sustainability*. 2019.
20. Mangones, S.; **Jaramillo, P.**; Fischbeck, P.; Rojas, N.Y. “Development of a high-resolution traffic emission model: lessons and key insights from the case of Bogotá, Colombia.” *Environmental Pollution*, 2019, 253: 552-559.
21. Ralston Fonseca, F.; **Jaramillo, P.**; Bergés, M.; Severnini, E. “Seasonal effects of climate change on intra-day electricity demand patterns.” *Climatic Change*, 2019, 154 (3-4): 435-451.
22. Tong, Fan, Azevedo, I. L.; **Jaramillo, P.** “Economic viability of a natural gas refueling infrastructure for long-haul trucks.” *Journal of Infrastructure Systems*, 2019, 25, 1: 04018039–12.
23. Farquharson, D., **Jaramillo, P.**, Samaras, C. “Sustainability implications of electricity outages in sub-Saharan

- Africa.” *Nature Sustainability*, 2018, 1: 589–597.
24. *Steven J. Davis*, Nathan S. Lewis, Matthew Shaner, Sonia Aggarwal, Doug Arent, Inês L. Azevedo, Sally M. Benson, Thomas Bradley, Jack Brouwer, Yet-Ming Chiang, Christopher T. M. Clack, Armond Cohen, Stephen Doig, Jae Edmonds, Paul Fennell, Christopher B. Field, Bryan Hannegan, Bri-Mathias Hodge, Martin I. Hoffert, Eric Ingersoll, **Paulina Jaramillo**, Klaus S. Lackner, Katharine J. Mach, Michael Mastrandrea, Joan Ogden, Per F. Peterson, Daniel L. Sanchez, Daniel Sperling, Joseph Stagner, Jessika E. Trancik, Chi-Jen Yang, and Ken Caldeira. “Net zero energy systems.” *Science*, 2018, 360 (6396): eaas9793
 25. *Craig, M.T.*; **Jaramillo, P.**; Hodge, B-M; Williams, N.J.; Severnini, E. “A retrospective analysis of the market price response to distributed photovoltaic generation in California.” *Energy Policy*, 2018, 121: 394–403.
 26. *Gilbraith, N.*; **Jaramillo, P.**; *Azevedo, I. L.* “Quantifying the capacity value of natural gas efficiency in New England.” *Utilities Policy*. 2018, 50, 101–110.
 27. *Craig, M. T.*; **Jaramillo, P.**; Hodge, B.-M. “Carbon dioxide emissions effects of grid-scale electricity storage in a decarbonizing power system.” *Environmental Research Letters*. 2018, 13 (1), 014004.
 28. *Williams, N. J.*; **Jaramillo, P.**; Taneja, J. “An investment risk assessment of microgrid utilities for rural electrification using the stochastic techno-economic microgrid model: A case study in Rwanda.” *Energy for Sustainable Development*. 2018, 42, 87–96.
 29. *Tong, F.*; Hendrickson, C. T.; Biehler, A.; **Jaramillo, P.**; Seki, S. “Life cycle ownership cost and environmental externality of alternative fuel options for transit buses.” *Transportation Research Part D: Transport and Environment*. 2017, pp 287–302.
 30. *Craig, M. T.*; Zhai, H.; **Jaramillo, P.**; Klima, K. “Trade-offs in cost and emission reductions between flexible and normal carbon capture and sequestration under carbon dioxide emission constraints.” *International Journal of Greenhouse Gas Control*. 2017. 66: 25–34.
 31. *de Faria, F. A. M.*; Davis, A. L.; Severnini, E.; **Jaramillo, P.** “The local socio-economic impacts of large hydropower plant development in a developing country.” *Energy Economics*. 2017, 67: 533–544.
 32. *de Faria, F. A. M.*; **Jaramillo, P.** “The future of power generation in Brazil: An analysis of alternatives to Amazonian hydropower development.” *Energy for Sustainable Development*. 2017. 41, 24–35.
 33. *Clack, C. T. M.*; Qvist, S. A.; Apt, J.; Bazilian, M.; Brandt, A. R.; Caldeira, K.; Davis, S. J.; Diakov, V.; Handschy, M. A.; Hines, P. D. H.; **Jaramillo, P.**; et al. “Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar.” *Proceedings of the National Academy of Sciences*. 2017. 114 (26): 6722–6727
 34. *Posen, I. D.*; Jaramillo, P.; Landis, A. E.; Griffin, W. M. “Greenhouse gas mitigation for U.S. plastics production: energy first, feedstocks later.” *Environmental Research Letters*. 2017, 12 (034024).
 35. *Roth, M. B.*; **Jaramillo, P.** “Going nuclear for climate mitigation: An analysis of the cost effectiveness of preserving existing U.S. nuclear power plants as a carbon avoidance strategy.” *Energy*. 2017. 131: 67–77
 36. *Craig, M. T.*; **Jaramillo, P.**; Zhai, H.; Klima, K. “The economic merits of flexible carbon capture and sequestration as a compliance strategy with the Clean Power Plan.” *Environmental Science and Technology*. 2017, 51 (3): 1102–1109.
 37. *Loew, A.*; **Jaramillo, P.**; Zhai, H. “Marginal costs of water savings from cooling system retrofits: a case study for Texas power plants.” *Environmental Research Letters*. 2017. 11 (10), 104004.
 38. *Mangones, S. C.*; Fischbeck, P.; **Jaramillo, P.** “Safety-related risk and benefit-cost analysis of crash avoidance systems applied to transit buses: Comparing New York City vs. Bogota, Colombia.” *Safety Science*. 2017. 91: 122–131.
 39. *Farquharson, D.*; **Jaramillo, P.**; *Schivley, G.*; Klima, K.; Carlson, D.; Samaras, C. “Beyond global warming potential: comparative application of climate impact metrics for the life cycle assessment of coal and natural gas-based electricity.” *Journal of Industrial Ecology*. 2016.
 40. *Berhanu, B. M.*; Blackhurst, M.; Kirisits, M. J.; **Jaramillo, P.**; Carlson, D. “Feasibility of water efficiency and

- reuse technologies as demand-side strategies for urban water management.” *Journal of Industrial Ecology*. 2016.
41. Rabmani, M.; **Jaramillo, P.**; Hug, G. “Implications of environmental regulation and coal plant retirements in systems with large scale penetration of wind power.” *Energy Policy*. 2016. 95: 196–210.
 42. Posen, I. D.; **Jaramillo, P.**; Griffin, W. M. “Uncertainty in the life cycle greenhouse gas emissions from U.S. production of three biobased polymer families.” *Environmental Science and Technology*. 2016; 50 (6): 2846–2858.
 43. **Jaramillo, P.**; Muller, N. Z. “Air pollution emissions and damages from energy production in the U.S.: 2002–2011.” *Energy Policy*. 2016; 90: 202–211.
 44. Weis, A.; **Jaramillo, P.**; Michalek, J. “Consequential life cycle air emissions externalities for plug-in electric vehicles in the PJM interconnection.” *Environmental Research Letters*. 2016; 024009.
 45. de Faria, F. A. M.; **Jaramillo, P.**; Sawakuchi, H. O.; Richey, J. E.; Barros, N. “Estimating greenhouse gas emissions from future Amazonian hydroelectric reservoirs.” *Environmental Research Letters*. **2015**; 124019.
 46. Tong, F.; **Jaramillo, P.**; Azevedo, I.M.; “Comparison of life cycle greenhouse gases from natural gas pathways for light-duty vehicles.” *Energy and Fuels*, 2015; 29 (9): 6008–6018.
 47. Williams, N.; **Jaramillo, P.**; Taneja, J.; Ustun, T. S.; “Enabling private sector investment in microgrid-based rural electrification in developing countries: a review.” *Renewable and Sustainable Energy Reviews*. 2015; 52: 1268–1281.
 48. Rubin, E. S.; Azevedo, I. M. L.; **Jaramillo, P.**; Yeh, S. “A review of learning rates for electricity supply technologies.” *Energy Policy*, 2015; 86: 198–218.
 49. Dowds, J.; Hines, P.; Ryan, T.; Buchanan, W.; Kirby, E.; Apt, J.; **Jaramillo, P.**; “A Review of Large-Scale Wind Integration Studies.” *Renewable and Sustainable Energy Reviews*, 2015; 49: 768–794.
 50. Tong, F.; **Jaramillo, P.**; Azevedo, I.M.; “A Comparison of Life Cycle Greenhouse Gases from Natural Gas Pathways for Medium and Heavy-Duty Vehicles.” *Environmental Science and Technology*, 2015; 49 (12): 7123–7133
 51. Weis, A.; Michalek, J.J.; **Jaramillo, P.**; Lueken, R.; “Emissions and Cost Implications of Controlled Electric Vehicle Charging in the U.S. PJM Interconnection.” *Environmental Science and Technology*, 2015; 49 (9): 5813–5819.
 52. Necefer, L.; Wong-Parodi, G.; **Jaramillo, P.**; Small, M. J. “Energy development and Native Americans: Values and beliefs about energy from the Navajo Nation.” *Energy Research & Social Science*, 2015; 7: 1–11.
 53. Gilbraith, N.; Azevedo, I. L.; **Jaramillo, P.** “Evaluating the benefits of commercial building energy codes and improving federal incentives for code adoption.” *Environmental Science and Technology*, 2014; 48: 14121–14130.
 54. Oates, D. L.; Versteeg, P.; Hittinger, E.; **Jaramillo, P.** “Profitability of CCS with flue gas bypass and solvent storage.” *International Journal of Greenhouse Gas Control*, 2014; 27: 279–288.
 55. Lamy, J.; Azevedo, I.M.; **Jaramillo, P.** “The role of energy storage in accessing remote wind resources in the Midwest.” *Energy Policy*, 2014; 68: 123–131.
 56. Weis, A.; **Jaramillo, P.**; Michalek, J.J.; “Estimating the Potential of Controlled Plug-in Hybrid Electric Vehicle Charging to Reduce Operational and Capacity Expansion Costs for Electric Power Systems with High Wind Penetration” *Applied Energy*. 2014; 115: 190–204.
 57. Mangmeechai, A.; **Jaramillo, P.**; Griffin, W. M.; Matthews, H.S. “Life cycle consumptive water use for oil shale development and implications for water supply in the Colorado River Basin.” *The International Journal of Life Cycle Life Cycle Assessment*. 2014; 19: 677–687
 58. Manch, B.; Apt, J.; Carvalho, P.M.S.; **Jaramillo, P.** “What day-ahead reserves are needed in electric grids with high levels of wind power?” *Environmental Research Letters*. 2013; 8 (3).
 59. Rose, S.; Apt, J.; Small, M.; **Jaramillo, P.** “Quantifying the hurricane catastrophe risk to offshore wind power.” *Risk Analysis*, **2013**; 33 (12): 2126–2141.
 60. Oates, D.L.; **Jaramillo, P.** “Production cost and air emissions impacts of coal-cycling in power systems

- with large-scale wind penetration.” *Environmental Research Letters*. 2013; 8.
61. Hussain, D.; Dzombak, D.A.; **Jaramillo, P.**; *Lowry, G.V.* “Comparative life cycle inventory (LCI) of greenhouse gas (GHG) emissions of enhanced oil recovery (EOR) methods using different CO₂ sources.” *International Journal of Greenhouse Gas Control*. 2013; 16: 129-144.
 62. Fertig, E.; Apt, J.; **Jaramillo, P.**; Katzenstein, W. “The effect of long-distance interconnection on wind power variability.” *Environmental Research Letters*. 2012; 7.
 63. Venkatesh, A.; **Jaramillo, P.**; Griffin, W.M.; Matthews, H.S. “Implications of changing natural gas prices in the United States electricity sector for SO₂, NO_x and life cycle GHG emissions.” *Environmental Research Letters*. 2012; 7.
 64. Venkatesh, A.; **Jaramillo, P.**; Griffin, W.M.; Matthews, H.S. “Implications of near-term coal power plant retirement for SO₂ and NO_x, and life cycle GHG emissions.” *Environmental Science and Technology*. 2012; 46 (18): 9838-9845.
 65. Venkatesh, A.; **Jaramillo, P.**; Griffin, W.M.; Matthews, H.S. “Uncertainty in life cycle greenhouse gas emissions from United States coal.” *Energy and Fuels*. 2012; 26 (8): 4917-4923.
 66. Rose, S.; **Jaramillo, P.**; Small, M.; Grossmann, I.; Apt, J. “Quantifying the hurricane risk to offshore wind turbines.” *The Proceedings of the National Academies of Science*. 2012; 109 (9): 3247-3252.
 67. Mashayekh, Y.; **Jaramillo, P.**; Samaras, C.; Hendrickson, C.T; Blackhurst, M.; MacLean, H.L.; Matthews, H.S. “Potential for sustainable transportation in cities to alleviate climate change impacts.” *Environmental Science & Technology*. 2012; 46 (5): 2529–2537.
 68. Venkatesh, A.; **Jaramillo, P.**; Griffin, W.M.; Matthews, H.S. “Uncertainty analysis of life cycle greenhouse gas emissions from United States natural gas end-uses and its effects on policy.” *Environmental Science & Technology*. 2011; 45 (19): 8182–8189.
 69. Michalek, J.J.; Chester, M.; **Jaramillo, P.**; Samaras, C.; Shiau, C.N.; Lave, L. “Valuation of plug-in vehicle life cycle air emissions and oil displacement benefits” *Proceedings of the National Academy of Sciences*. 2011; 108 (40): 16554-16558.
 70. Mashayekh, Y.; **Jaramillo, P.**; Chester, M.; Hendrickson, C.T.; Weber, C.L. “Costs of automobile air emissions in U.S. metropolitan areas.” *Transportation Research Record: The Journal of the Transportation Research Board* Issue 2233. 2011; 120-127.
 71. Jiang, M.; Griffin, W.M.; Hendrickson, C.; **Jaramillo, P.**; VanBriesen, J; Venkatesh, A. “Life cycle greenhouse gas emissions of Marcellus shale gas.” *Environmental Research Letters*. 2011; 6.
 72. Hassan, M.N.A.; Griffin, W.M.; **Jaramillo, P.** “Life cycle GHG emissions from Malaysian oil palm bioenergy development: the impact on transportation sector's energy security.” *Energy Policy*. 2011; 39 (5): 2615-2625.
 73. Venkatesh, A.; **Jaramillo, P.**; Griffin, W.M.; Matthews, H.S., “Uncertainty analysis of life cycle greenhouse gas emissions from petroleum-based fuels and impacts on low carbon fuel policies.” *Environmental Science & Technology*. 2011; 45 (1): 125–131.
 74. Hendrickson, C.; Matthews, D. H.; Ashe, M.; **Jaramillo, P.**; McMichael, F. C., “Reducing environmental burden of solid-state lighting through end-of-life design.” *Environmental Research Letters*. 2010; 5 (1).
 75. Weber, C.; **Jaramillo, P.**; Marriott, J.; Samaras, C., “Life cycle assessment and grid electricity: what do we know and what can we know?” *Environmental Science & Technology*. 2010; 44 (6): 1895-1901.
 76. **Jaramillo, P.**; Griffin, W.M.; McCoy, S. “Life cycle inventory of CO₂ in an enhanced oil recovery system.” *Environmental Science & Technology*. 2009; 43 (21): 8027-8032.
 77. Matthews, D., Hawkins, T., **Jaramillo, P.**, Marriott, J., Sharrard, A., “The green design apprenticeship: how an outreach program strengthens graduate research.” *Journal of Industrial Ecology*. 2009; 13 (3): 467-476.
 78. **Jaramillo, P.**; Samaras, C.; Meisterling, K.; Weakley, H. “Using coal for transportation: life cycle assessment of coal-to-liquids, plug-in hybrid, and hydrogen pathways.” *Energy Policy*. 2009; 37: 2689–2695.
 79. **Jaramillo, P.**; Griffin, W.M; Matthews; H. S. “Comparative analysis of the production costs and life cycle GHG emissions of FT-liquids from coal and natural gas.” *Environmental Science & Technology*. 2008; 42 (20),

7559–7565

80. **Jaramillo, P.**; Griffin, W.M; Matthews; H. S. “Comparative life cycle air emissions of coal, domestic natural gas, LNG, and SNG for electricity generation.” *Environmental Science & Technology*. 2007; 41 (17): 6290-6296.
81. **Jaramillo, P.**; Matthews, H. S. “Landfill-gas-to-energy projects: analysis of net private and social benefits.” *Environmental Science & Technology*; 2005; 39 (19): 7365-7373.

Journal Articles, Letters, and Reports (Not peer-reviewed)

82. **Jaramillo, P.** “Macro Energy Systems Modeling for the Least Developed and Developing Countries—a Call for Action.” *Environmental Research Letters*. **2022**. 17, 120201
83. Hittinger, E.; **Jaramillo, P.** Internet of things: energy boon or bane? *Science*; 2019. 364 (6438): 326–328.
84. Oates, D. L.; **Jaramillo, P.** “State cooperation under the EPA's proposed clean power plan.” *The Electricity Journal*; **2015**. 28 (3): 26-40
85. Gilbraith, N.; **Jaramillo, P.**; Tong, E.; Faria, F. “Comments on Jacobson et al’s proposal for a wind, water, and solar energy future for New York State.” *Energy Policy*. **2013**. 60: 68-69.
86. Azevedo, I. L., **Jaramillo, P.**, Rubin, E., Yeh, S., “Modeling technology learning for electricity supply technologies.” Phase I report for the Electric Power Research Institute. **2013**.
87. Blanco, C.; Apt, J.; **Jaramillo, P.** “Conventional generation asset management with renewable portfolio standards using real options.” Report for the National Energy Technology Laboratory. Report #: DOE/NETL-2013-1619. May **2013**.
88. Rose, S.; **Jaramillo, P.**; Small, M.; Grossmann, I.; Apt, J. “Response to Powell and Cocke: On the probability of catastrophic damage to offshore wind farms from hurricanes in the U.S. Gulf Coast.” *The Proceedings of the National Academies of Science*. **2012**; 109 (33): E2193-E2194.
89. Changala, D.; Dworkin, M.; Apt, J.; **Jaramillo, P.** “Comparative analysis of conventional oil and gas and wind project decommissioning regulations on federal, state, and county lands.” *The Electricity Journal*. **2012**; 25 (1), 1-17.

Conference Proceedings

90. Williams, N. J.; **Jaramillo, P.**; Cornell, B.; Lyons-Galante, I.; Wynn, E. “Load characteristics of East African microgrids.” IEEE PES Power Africa Conference, **2017**; pp 236–241.
91. Williams, N. J.; **Jaramillo, P.**; Taneja, J. “PV-array sizing in hybrid diesel/PV/battery microgrids under uncertainty.” IEEE PES Power Africa Conference, **2016**; pp 189–193.
92. McCoy, S.; Pollak, M.; **Jaramillo, P.** “Geologic sequestration through EOR: policy and regulatory considerations for greenhouse gas accounting.” *Energy Procedia*. **2011**; 4: 5794-5801.
93. Matthews, D.H.; Matthews, H.S.; **Jaramillo, P.**; Weber, C.L.; “Energy consumption in the production of high-brightness light-emitting diodes” Proceedings of the 2009 IEEE Symposium on Sustainable Systems and Technology. May 18-20, **2009**. 6 pages.
94. Weber, C.L.; **Jaramillo, P.**; Marriott, J.; Samaras, C. “Uncertainty and variability in accounting for grid electricity in life cycle assessment” Proceedings of the 2009 IEEE Symposium on Sustainable Systems and Technology. May 18-20, **2009**. 8 pages.
95. Weber, C.L.; Hendrickson, C.T.; Matthews, H.S.; Nagengast, A.; Nealer, R.; **Jaramillo, P.** “Life cycle comparison of traditional retail and e-commerce logistics for electronic products: A case study of buy.com” Proceedings of the 2009 IEEE Symposium on Sustainable Systems and Technology. May 18-20, **2009**. 6 pages.
96. **Jaramillo, P.**; Marriott, J.; Matthews, D.H. “How much electricity do you use? An activity to teach high school students about energy issues,” Proceedings of the 2008 IEEE International Symposium on Electronics and the Environment, May 19-22, **2008**. 5 pages.

Policy Briefings

97. **Jaramillo, P.**, J. Johnson, A. Sinha, C Wade, Katherine Jordan, Mike Blackhurst, Jeff Hyink, Anderson De Queiroz, I. Daniel Posen. “Second Open Energy Outlook Report: Decarbonization Pathways for the

- USA.” Published by the Scott Institute for Energy Innovation. March 2024.
98. **Jaramillo, P.**, M. Blackhurst, J. Johnson, A. de Queiroz, A. Sinha, and C. Wade. "Comments on Proposed Rulemaking Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election to Treat Clean Hydrogen Production Facilities as Energy Property." January 2024.
 99. **Jaramillo, P.**, J. Johnson, K. Jordan, A. Sinha, A. Venkatesh. "An Open Energy Outlook: Decarbonization Pathways for the USA." Scott Institute for Energy Research and Innovation. Carnegie Mellon University. September 2022.
 100. Oates, D.L.; Apt, J.; **Jaramillo, P.** "Comments of the Carnegie Mellon Electricity Industry Center on proposed energy information administration collection extensions with changes." Submitted to the Energy Information Administration. January 22, **2014**.
 101. Apt, J.; **Jaramillo, P.**; Stine, D. D. "Managing Variable Energy Resources to Increase Renewable Electricity's Contribution to the Grid." Wilton Scott Institute Guide for Policy-Makers. **2013**.
 102. Stine, D.D.; Adams, P.; Casman, E.; Gregory, K.; Griffin, W.M.; Hendrickson, C.T.; **Jaramillo, P.**; Jiang, M.; Mitchell, A.; Robinson, A.; Roy, A.; VanBriesen, J. "Shale gas and the environment: critical need for a government–university–industry research initiative." Wilton Scott Institute Guide for Policy-Makers. **2013**.
 103. **Jaramillo, P.**; Apt, J.; Hines, P. "Comments of the RenewElec project of the integration of variable energy resources notice of proposed rulemaking." Submitted to the United States Federal Energy Regulatory Commission. Docket No. RM10-11-000. March 2, **2011**.
 104. **Jaramillo, P.**, Samaras, C. "For energy security and greenhouse gas reductions, plug-in hybrids a more sensible pathway than coal-to-liquids gasoline." Carnegie Mellon Electricity Industry Center Working Paper 07-04. **2007**.

Books and Chapters

105. **Jaramillo, P.**, S. Kahn-Ribeiro, P. Newman, S. Dhar, O.E. Diemuodeke, T. Kajino, D.S. Lee, S.B. Nugroho, X. Ou, A. Hammer Stromman, J. Whitehead, **2022**: Transport. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi:10.1017/978100157926.012
106. Apt, J.; **Jaramillo, P.**; Dowds, J.D.; Dworkin, M.; Fertig, E.; Handschy, M.; Hines, P.; Hittinger, E.; Katzenstein, W.; Kirby, E.; Lueken, C.; Lueken, R.; Mauch, B.; Moore, J.; Morgan, M.G.; Nordhaus, R.R.; Oates, D.L.; Peterson, S.; Rose, S.; Stine, D.; Weis, A. and Yaffe, D. "Variable Renewable Energy and the Electricity Grid" June **2014**. 368 pp. ISBN 978-0-415-73301-4.

SELECTED CONFERENCE AND PROFESSIONAL PRESENTATIONS (Since 2017)

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1. **Jaramillo, P.** (Presenter). "An Open Energy Outlook for the U.S." Invited presentation at the Edward Wenk, Jr. Endowed Lectureship at the University of Washington. Seattle, Washington. December 5, 2022.
 2. **Jaramillo, P.** (Panelist). "Emission Reduction Paths in the Road Transport Sector toward Carbon Neutrality Concepts in the IPCC AR6." Event at the Japan Pavilion of COP27. Sharm el-Sheikh, Egypt. November 18, 2022.
 3. **Jaramillo, P.** (Panelist). "Global energy demand and our environment." All Angles Program. University of Pittsburgh. Pittsburgh, PA. October 26, 2022
 4. **Jaramillo, P.** (Panelist). "Panel discussion on global energy access and policy." Breakthrough Energy Fellows Week. Pittsburgh, PA. September 22, 2022.
 5. **Jaramillo, P.** (Panelist). "Panel discussion on climate action" Intersect@CMU conference. February 11, 2022. Online
 6. **Jaramillo, P.** (Panelist). "Exploring EVs, electrification & policy priorities in the transportation sector." The Block Center for Technology and Society. January 25, 2022. Online

7. **Jaramillo, P** (Panelist). “Modeling decarbonization in developing countries.” Macro-Energy Systems Speaker Series. December 10, 2021. Online
8. **Jaramillo, P** (Panelist). “Smart takes on climate change.” Andrew Carnegie Fellows Discussions. December 8, 2021. Online
9. **Jaramillo, P** (Presenter). “The future of power generation in Brazil: An analysis of alternatives to Amazonian hydropower development.” Presented at the Civil and Environmental Engineering Seminar Series at Florida International University. Miami, FL: January 11, 2019.
10. **Jaramillo, P** (Presenter). “Climate-driven risks to water and electricity systems in the southeastern U.S.” Presented at the Annual Meeting of the American Geophysical Union. Washington, DC: December 11, 2018.
11. **Jaramillo, P** (Presenter). “(Some) Sustainability impacts of unreliable power systems in Sub Saharan Africa.” Presented at the Energy Research Centre of the University of Cape Town. Cape Town, South Africa: July 2, 2018.
12. **Jaramillo, P** (Presenter). “(Some) Sustainability impacts of unreliable power systems in Sub Saharan Africa.” Presented at the Gordon Research Conference for Industrial Ecology. Les Diablerets, Switzerland: May 23, 2018.
13. **Jaramillo, P** (Presenter). “Research on transitions to a decarbonized power system.” Presented at the CEE graduate student seminar series at the University of Washington. Seattle, Washington: April 12, 2018
14. **Jaramillo, P** (Presenter). “Transitions to a decarbonized power system.” Presented at Seminar Series for the Center for Industrial Ecology. Yale University. New Haven, Connecticut: January 18, 2018
15. **Jaramillo, P** (Presenter). “Transitions to a decarbonized power system.” Presented at Seminar Series on Emerging Topics in Sustainable Electric Power Systems. University of Michigan. Ann Arbor, Michigan: November 30, 2017
16. Craig, M.; **Jaramillo, P** (Presenter); Hodge, M-B. “Carbon dioxide emissions effects of grid-scale electricity storage in a decarbonizing power system.” Presented at the Annual Meeting of the U.S. Association for Energy Economics. Houston, Texas: November 15, 2017.
17. **Jaramillo, P** (Presenter). “Academic adventures at CMU Africa.” Presented at the Scott Institute Seminar Series. Carnegie Mellon University. Pittsburgh, PA: October 2, 2017.

IN THE MEDIA

1. Yale Climate Connections. “Hydropower could provide electricity to more people in sub-Saharan Africa. December 8, 2022. <https://yaleclimateconnections.org/2022/12/hydropower-could-provide-electricity-to-more-people-in-sub-saharan-africa/>
2. Yale Climate Connections. “Climate change could dry hydropower in some regions.” November 7, 2022. <https://yaleclimateconnections.org/2022/11/climate-change-could-dry-up-hydropower-in-some-regions/>
3. Bill Gourgey. “Why hasn’t Henry Ford’s ideal power grid become a reality?” Popular Science. July 27, 2022. <https://www.popsci.com/environment/henry-ford-how-power-will-set-men-free/>
4. Benjamin Storrow. “Hope dims that the U.S. can meet 2030 climate goals.” E&E News. July 8, 2022. <https://www.scientificamerican.com/article/hope-dims-that-the-u-s-can-meet-2030-climate-goals/>
5. Reid Frazier. “Hydrogen may be a climate solution. There’s debate over how clean it will truly be.” The Allegheny Front. May 27, 2022. <https://www.npr.org/2022/05/27/1096584260/clean-energy-hydrogen-energy-climate-change>
6. Volts Podcast. “On the IPCC’s new climate solutions report.” April 13, 2022. <https://volts.wtf/p/volts-podcast-paulina-jaramillo-on#details>
7. Programa Dinero. “El riesgo mayor que enfrenta Miami con el cambio climático, ¿el agua?” CNN en Español. September 6, 2018. <https://www.youtube.com/watch?v=OumX9V2gEn0&t=27s>

8. Brad Plumer. "How retiring nuclear power plants may undercut U.S. climate goals." The New York Times. June 12, 2017. <https://www.nytimes.com/2017/06/13/climate/nuclear-power-retirements-us-climate-goals.html?mcubz=2&r=0>
9. Reid Frazier. "Air pollution from energy industry costs \$130 billion a year." The Allegheny Front. February 19, 2016. <http://www.alleghenyfront.org/air-pollution-costs-americans-130-billion-a-year/>
10. Chelsea Harvey. "The staggering economic cost of air pollution." The Washington Post. January 29, 2016. <https://www.washingtonpost.com/news/energy-environment/wp/2016/01/29/the-staggering-economic-cost-of-air-pollution/>
11. Andrew Revkin. "Certainties, Uncertainties and Choices with Global Warming." Dot Earth Blog at the New York Times. September 16, 2014. <http://dotearth.blogs.nytimes.com/2014/09/26/certainties-uncertainties-and-choices-with-global-warming/?php=true&type=blogs&r=0>
12. Mathew L. Wald. "E.V.'s could be key part of a changing electrical grid." Wheels Blog of The New York Times. January 23, 2014. <http://www.nytimes.com/2014/01/24/automobiles/evs-could-be-key-part-of-a-changing-electrical-grid.html?smid=tw-nytimeswheels&scid=auto&r=1>
13. Andrew Revkin. "A Reality Check on a Plan for a Swift Post-Fossil Path for New York." Dot Earth Blog at the New York Times. June 18, 2013. <http://dotearth.blogs.nytimes.com/2013/06/18/a-reality-check-on-a-plan-for-a-swift-post-fossil-path-for-new-york/>
14. Reid Frazier. "Scientists square off over fracking's impact on climate." The Allegheny Front. July 7, 2012. <http://www.alleghenyfront.org/story/scientists-square-over-frackings-impact-climate-0>
15. Mark Collette. "Study: offshore wind farms at risk from hurricanes." Corpus Christi Caller Times. February 13, 2012. <http://www.caller.com/news/2012/feb/13/study-offshore-wind-farms-at-risk-from/>
16. Diane Cardwell. "Will hurricanes topple U.S. wind turbines?" The New York Times Green Blog. February 13, 2012. <http://green.blogs.nytimes.com/2012/02/13/will-hurricanes-topple-u-s-wind-turbines/>
17. Talia Buford. "Dueling research converges on gas." Politico.com. August 25, 2011.
18. Hope, D. "Gas less polluting than coal in the long run, CMU study says." Pittsburgh Post-Gazette. August 20, 2011. <http://www.post-gazette.com/pg/11232/1168671-503-0.stm>
19. Ken Ward Jr. "The plot thickens: debate continues over potential greenhouse gas emissions from natural gas." The Charleston Gazette. August 19, 2011. <http://blogs.wvgazette.com/watchdog/2011/08/19/the-plot-thickens-debate-continues-over-potential-greenhouse-gas-emissions-from-natural-gas/>
20. Donald Gillignad. "The patriot news new shale study refutes Cornell: Marcellus gas better than coal" August 17, 2011. http://www.pennlive.com/midstate/index.ssf/2011/08/new_shale_study_refutes_cornel.html
21. Mongabay News. "Imported LNG could have 35% higher GHG emissions than coal." August 23, 2007. <http://news.mongabay.com/2007/0823-lng.html>
22. ScienceNews. "Natural gas imported to U.S. for electricity generation may be environmentally worse than coal." August 22, 2007. <http://www.sciencedaily.com/releases/2007/08/070822132122.htm>

RESEARCH GRANTS

Principal Investigator

1. Wilton E. Scott Institute for Energy Innovation and Research at CMU, "Climate Risk Assessment for Electricity Transmission Assets in the U.S." \$79,350. August 2023 to July 2024. Co-PI: David Rounce, Hamish Gordon, and Peter Adams.
2. The Sloan Foundation, "Sustaining the Open Energy Outlook for the U.S." \$409,175. May 2023 to April 2025. Co-PI: Jeremiah Johnson (NC State)
3. The Environmental Defense Fund, "Model Intercomparison for a Decarbonized U.S. Electricity Grid." \$150,000. August 2022 to May 2024. Co-PI: Aranya Venkatesh

4. The Rockefeller Foundation, “Interconnected Development Pathways in Sub-Saharan Africa.” \$5.5 million (~\$560,000 at CMU). September 1, 2021 to August 31, 2024. Co-PIs: Nathan Williams (RIT), Jay Taneja (UMass), Vijay Modi (Columbia), and AtlasAI.
5. The Andrew Carnegie Corporation, “Energy, Climate, and Perceptions of Fairness in Sub-Saharan Africa.” \$200,000. September 2020 to August 2022.
6. The Sloan Foundation, “Open Energy Outlook for the U.S.” \$400,000 (~\$195,000 at CMU). July 2019 to June 2022. Co-PI: Joseph DeCarolis (NC State)
7. The Rockefeller Foundation, “Energy Growth and Use in Developing Economies (E-GUIDE).” \$3.79 million (~\$900,000 at CMU). January 1, 2019 to December 31, 2022. Co-PIs: Nathan Williams (RIT), Jay Taneja (UMass), Vijay Modi (Columbia), Morgan Bazilian (Colorado School of Mines).
8. The National Science Foundation, “Consequential life cycle assessment for novel energy technologies - the case of energy storage.” \$299,937. September 1, 2017 to August 31, 2020.
9. The National Renewable Energy Laboratory, “Microgrid project survey research and technical advisory to developers in Africa.” \$95,009. September 1, 2017 to July 31, 2018.
10. The National Renewable Energy Laboratory, “Microgrid cost study.” \$49,958. June 1, 2017 to July 31, 2018.
11. The National Science Foundation, “Supplemental Funding for RIPS type 2 collaborative research: water and electricity infrastructure in the southeast (WEIS) - approaches to resilient interdependent systems under climate change.” \$288,075. January 1, 2016 to December 31, 2017.
12. The National Science Foundation, “RIPS type 2 collaborative research: water and electricity infrastructure in the southeast (WEIS) - approaches to resilient interdependent systems under climate change.” \$1,440,425. January 1, 2015 to December 31, 2017.
13. The National Oceanic and Atmospheric Administration, “Climate change and water availability: evaluating and mitigating risks in the electric power sector.” \$184,906. August 1, 2014 to July 31, 2017.
14. The Cynthia and George Mitchell Foundation, “Input-Output Analysis and Optimization of Water Use in Texas.” \$100,169. October 1, 2014 to April 30, 2016.
15. The Fuels Institute, “Comparative analysis of the economic and environmental impacts of CNG and LNG for the transportation sector.” \$152,455. March 15, 2014 to March 14, 2015.
16. The Cynthia and George Mitchell Foundation, “Water supply in Texas: an evaluation of water supply curves.” \$101,996. December 2013 to November 2014.
17. National Energy Technology Laboratory, “Power grid reliability implication of environmental regulation and coal plant retirements in systems with large scale penetration of wind power.” \$254,619. January 2013 to December 2014. Co-PIs: Gabriela Hug and Jay Apt.
18. G8 Research Council through the National Science Foundation, “Reduced emission cement: cradle to grave material applications and accounting creating sustainable low-carbon.” \$350,000. September 2012 – August 2015.
19. National Energy Technology Laboratory, “Coal power plant operations in a system with increased wind power.” \$250,000. January 2012 to November 2013. Co-PI: Jay Apt.

Co- Principal Investigator

20. The National Science Foundation, “PIRE: Deeply Decarbonizing Global Industrial Supply Chains: Technology, Organizational Practices, and Institutional Design.” \$1,499,635. January 2023 to December 2025. PI: Valerie Karplus. Co-PIs: Edson Severnini and Chris Pistorius
21. The National Science Foundation, “Collaborative Research: AccelNet: Clean Air Monitoring and Solutions Network (CAMS-Net).” \$500,000. October 2022 to September 2025. PI: Albert Presto
22. Wilton E. Scott Institute for Energy Innovation and Research at CMU, “Reduced-form risks models for hydropower projects under climate change” \$69,990. January 4, 2018 to June 30, 2019. PI: H. Scott Matthews. Co-PI: Costa Samaras

23. Wilton E. Scott Institute for Energy Innovation and Research at CMU, “Regulatory interactions and unintended environmental impacts in the power generation sector.” \$75,000. January 1, 2015 to December 31, 2015. PI: Jeanne VanBriesen. Co-PI: Costa Samaras.
24. The Fuel Freedom Foundation, “Assessment of comparative economic and environmental impacts of alternative light duty vehicle liquid fuels produced from natural gas.” \$418,000. March 1, 2013 to April 1, 2015. PI: Chris Hendrickson. Co-PIs: Rick Stafford and Mike Griffin.
25. Electric Power Research Institute, “Modeling technology learning for electricity supply technologies: A comprehensive review and recommendations for the EPRI REGEN model.” \$249,052. June 2012 to March 2013. PI: Ed Rubin. Co-PIs: Ines Azevedo and Sonia Yeh.
26. National Energy Technology Laboratory, “Fossil plant mothball and reactivation decisions with increased wind power.” \$250,000. January 2012 to November 2013. PI: Jay Apt.
27. National Science Foundation, “Congestion management to promote sustainability.” \$295,206. August 2010 to August 2013. PI: Chris Hendrickson.

Affiliated

28. Steinbrenner Institute for Environmental Research, “Net-zero carbon energy pathways for East Africa” Student: Joan Nkiriki. September 2019 – August 2020.
29. Environmental Protection Agency, “Center for Climate, Air, and Energy Solutions.” \$10 million. August 2016 to July 2021. PI: Allen Robinson
30. Steinbrenner Institute for Environmental Research, “Reduced-form risks models for hydropower projects under climate change” Student: Ana Caceres. September 2018 – August 2019.
31. Steinbrenner Institute for Environmental Research, “Assessing the System-Wide Merits of Flexible Carbon Capture and Sequestration Power Plants in Complying with the Clean Power Plan.” Student: Michael Craig. September 2015 – August 2016.
32. Schlumberger Foundation Faculty for the Future Fellowship Program. Student: Sonia Mangones. June 2014 – July 2016.
33. Steinbrenner Institute for Environmental Research, “An analysis of trade-offs of different natural gas consumption pathways.” Student: Fan Tong. September 2013 – August 2014.
34. National Science Foundation Graduate Research Fellowship, “Can controlled charging of electric vehicles reduce the economic and environmental implications of integrating wind power into the electricity grid?” Student: Allison Weis. June 2012 – May 2015.

Gifts

35. ExxonMobil. \$20,000. November 2014.

ADVISING

Current Ph.D. Students

Primary Advisor Role

1. Emily Zuetell - Ph.D. candidate, Engineering and Public Policy. Subject: Interdependent Development Pathways in Sub-Saharan Africa. (2021-present)
2. Katherine Jordan - Ph.D. candidate, Engineering and Public Policy. *Co-Advisors*: Peter Adams and Nick Muller. Subject: Low-carbon transitions for hard-to-decarbonize sectors of the U.S. Economy. (2019-present)
3. Catalina Moreno - Ph.D. candidate, Engineering and Public Policy. Subject: CO2 storage potential in geologic formations in Colombia. (2022-present)
4. Nana Oye Djan - Ph.D. candidate, Engineering and Public Policy. Subject: Climate impact evaluation on African natural systems using remotely sensed data. (2023-present)
5. Fidelis Bologo - Ph.D. candidate, Engineering and Public Policy. Subject: Climate impact evaluation on African agricultural systems using remotely sensed data. (2023-present)

Co-Advisor Role

6. Paa Sey - Ph.D. candidate, Mechanical Engineering. *Primary Advisors:* Albert Presto. Subject: Air quality modeling in Sub-Saharan Africa

Ph.D. Thesis Committee Service

1. Katrina Ramirez-Meyers - Ph.D. in Engineering and Public Policy. 2023. Experimental and Techno-Economic Analyses of Low-Cost Battery Materials and Processes. *Thesis Committee:* Jay Whitacre (Chair), Barry Rawn, Chris Pistorius, **Paulina Jaramillo**, Rebecca Ciez (Purdue).
2. Joan Nkiriki - Ph.D. in Engineering and Public Policy. 2023. Energy Access and Climate Mitigation. Impacts on Technology Choice, Emissions, and Costs in East Africa. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Aranya Venkatesh (EPRI), Nathan Williams (RIT), Valerie Karplus.
3. Dini Maghfirra - Ph.D. in Engineering and Public Policy. 2023. Equitable Deployment of Microhydro Power and Solar Photovoltaic to Provide Universal Electricity Access in Rural Indonesia. *Thesis Committee:* Granger Morgan (co-Chair), Jerry Cohon (co-Chair), **Paulina Jaramillo**, Peter Zhang, Dimitrios Mentis (WRJ).
4. Nyla Khan - Ph.D. in Engineering and Public Policy. 2022. Analyzing Production, Recycling, and Supply Chain Risks for Battery Minerals in Electric Vehicles and Stationary Storage. *Thesis Committee:* **Paulina Jaramillo (co-Chair)**, Jay Whitacre (co-Chair), Valerie Karplus, Rebecca Ciez (Purdue).
5. Ana Caceres – Climate Induces Risks on Hydropower Systems in the Global South. Ph.D. in Engineering and Public Policy. 2022. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Scott Matthews, Costa Samaras, and Bart Nijssen (University of Washington).
6. Jorge Izar – A look at the Food-Energy-Water Nexus Through Diverse Case Studies. Ph.D. in Engineering and Public Policy. 2021. *Thesis Committee:* **Paulina Jaramillo (Co-Chair)**, Nathan Williams (RIT, Co-Chair), Mitch Small, Jay Taneja (UMass), Vijay Modi (Columbia).
7. Michael Roth – Going Nuclear For Climate Mitigation And Internalizing Damages From CO₂ And Air Pollution Emissions. Ph.D. in Engineering and Public Policy. 2020. *Thesis Committee:* **Paulina Jaramillo (Co-Chair)**, Nick Muller (Co-Chair), Peter Adams (Co-Chair), Allen Robinson, Timothy Johnson (Duke).
8. Francisco Fonseca - Effects of Climate Change On The Power System: A Case Study Of The Southeast U.S. Ph.D. in Engineering and Public Policy. 2020. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Mario Berges, Haibo Zhai, Bart Nijssen (University of Washington)
9. DeVynne Farquharson – Sustainable Energy Transitions in Sub-Saharan Africa: Impacts on Air Quality, Economics, and Fuel Consumption. Ph.D. in Engineering and Public Policy. 2019. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Costa Samaras (Co-Chair), Jeremy Michalek, Barry Rawn.
10. Chukwudi Kenechukwu Udeani – Improving Electricity Access and Reliability Using Residential Solar Systems with Battery Storage Systems in Sub-Saharan Africa. Ph.D. in Engineering and Public Policy. 2019. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Nathan Williams, Mario Berges, Alex Davis.
11. Julia Chelen: The Natural Language of the Electric Industry: Climate Change Discourse and Decisions in Public Disclosure Filings. Ph.D. in Engineering and Public Policy. 2019. *Thesis Committee:* Gabrielle Wong-Parodi (Co-Chair), Baruch Fischhoff (Co-Chair), **Paulina Jaramillo**, Howard Seltman.
12. Aviva Loew: Tradeoffs in Energy, Water Use, and Cost at Thermoelectric Power Plants. Ph.D. in Engineering and Public Policy. 2018. *Thesis Committee:* **Paulina Jaramillo (Chair)**, Haibo Zhai (co-Chair), Kelly Klima (RAND), and Bart Nijssen (University of Washington).
13. Greg Schivley: Environmental Implications of Energy Transitions. Ph.D. in Civil and Environmental Engineering. 2018. *Thesis Committee:* Costa Samaras (Chair), Ines Azevedo, Scott Matthews, Zico Kolter, **Paulina Jaramillo**.

14. Michael Craig: Economic and Environmental Costs, Benefits, and Trade-offs of Low-Carbon Technologies in the Electric Power Sector. Ph.D. in Engineering and Public Policy. 2017. *Thesis Committee: Paulina Jaramillo (Chair), Haibo Zhai, Kelly Klima (RAND), Bri-Mathias Hodge (then at NREL).*
15. Sonia Mangones: Impacts on Safety and Air Pollution from Transportation Policies in Bogotá, Colombia. Ph.D. in Engineering and Public Policy. 2017. *Thesis Committee: Paulina Jaramillo (Chair), Paul Fischback, Sean Qian, Nestor Rojas (National University of Colombia).*
16. Nathan Williams: Microgrid Utilities for Rural Electrification in East Africa: Challenges and Opportunities. PhD in Engineering and Public Policy. Carnegie Mellon University. 2017. *Thesis Committee: Paulina Jaramillo (Chair), Jay Taneja (UMass), Tim Brown, Eric Hittinger (RIT)*
17. Daniel Posen: Fuel, Feedstock, or Neither? – Evaluating Tradeoffs in the Use of Biomass for Greenhouse Gas Mitigation. PhD in Engineering and Public Policy; PhD in Civil and Environmental Engineering. Carnegie Mellon University. 2016. *Thesis Committee: Mike Griffin (Chair), Scott Matthews, Paulina Jaramillo, Costa Samaras.*
18. Leslie Abrahams: Quantitative Modeling Under Uncertainty to Inform Effective Energy and Environmental Policies. Ph.D. in Engineering and Public Policy & Civil and Environmental Engineering. 2016. *Thesis Committee: Mike Griffin (Chair), Scott Matthews, Paulina Jaramillo, Costa Samaras.*
19. Fan Tong: The Good, the Bad, and the Ugly: Economic and Environmental Implications of Using Natural Gas to Power On-Road Vehicles in the United States. PhD in Engineering and Public Policy. Carnegie Mellon University. 2016. *Thesis Committee: Paulina Jaramillo (Co-Chair), Ines Azevedo (Co-Chair), Chris Hendrickson, Jeremy Michalek, Sean Qian.*
20. Julian Lamy: Optimal Locations for Siting Wind Energy Projects: Technical Challenges, Economics, and Public Preferences. PhD in Engineering and Public Policy. Carnegie Mellon University. 2016. *Thesis Committee: Ines Azevedo (Chair), Paulina Jaramillo, Granger Morgan, Ryan Wisser (LBNL), Wandí Bruine de Bruin (then at University of Leeds).*
21. Shelly Hagerman: Economics of Behind-The-Meter Solar PV and Energy Storage. PhD in Engineering and Public Policy. Carnegie Mellon University. 2016. *Thesis Committee: Granger Morgan (Co-Chair), Paulina Jaramillo (Co-Chair), Jay Whitacre, Michael Dworkin (then at Vermont Law School).*
22. Felipe Faria: Hydropower Development in the Brazilian Amazon. PhD in Engineering and Public Policy. Carnegie Mellon University. 2016. *Thesis Committee: Paulina Jaramillo (Chair), Alex Davis, Ines Azevedo, Sergio Pacca (University of Sao Paulo).*
23. Nathaniel Gilbraith: Evaluating how Demand Side Resources Affect the Environmental and Economic Performance of Energy Systems. PhD in Engineering and Public Policy. Carnegie Mellon University. 2015. *Thesis Committee: Ines Azevedo (Chair), Pedro Carvacho (co-Chair), Manuel Heitor (ITS-Portugal), Paulina Jaramillo, Julia Popova (NYISO).*
24. Todd Ryan: Case Studies in the Economics of Ancillary Services of Power Systems in Support of High Wind Penetrations. PhD in Engineering and Public Policy. Carnegie Mellon University. 2015. *Thesis Committee: Paulina Jaramillo (Chair), Gabriela Hug (co-Chair, then at CMU), Mario Berges, Paul Hines (University of Vermont).*
25. David Luke Oates: Low Carbon Policy and Technology in the Power Sector - Evaluating Economic and Environmental Effects. PhD in Engineering and Public Policy. Carnegie Mellon University. 2015. *Thesis Committee: Paulina Jaramillo (Chair), Edward Rubin, Cosma Shalizi, Rebecca Nugent, Bri-Mathias Hodge (then at NREL).*
26. Allison Weis: Electric Vehicles and the Grid: Interactions and Environmental and Health Impacts. PhD in Engineering and Public Policy. Carnegie Mellon University. 2015. *Thesis Committee: Paulina Jaramillo (Chair), Jeremy Michalek (co-Chair), Gabriela Hug, Nicholas Muller (then at Middlebury College)*
27. Stephen Rose: Assessing the costs and risks of novel wind turbine applications. PhD in Engineering and Public Policy. Carnegie Mellon University. 2013. *Thesis Committee: Jay Apt (Chair), Paulina Jaramillo, Mitchell Small, John Zack (then at AWS TruePower).*

28. Bryony Laura DuPont: Exploring the Application of an Advanced Extended Pattern Search Algorithm within a Multi-Agent System to Wind Farm Optimization. PhD in Mechanical Engineering. Carnegie Mellon University. 2013. *Thesis Committee: Jonathan Cagan (Chair), Patrick Moriarty (NREL), Paulina Jaramillo, Levent Burak Kara.*
29. Yeganeh Mashayekh: Land use and congestion management strategies to promote urban environmental sustainability. PhD in Civil & Environmental Engineering and Engineering & Public Policy. Carnegie Mellon University. 2013. *Thesis Committee: Chris T. Hendrickson (Chair), H. Scott Matthews, Paulina Jaramillo, and Allen Biebler.*
30. Aranya Venkatesh: Towards robust energy systems modeling: Examining uncertainty in fossil fuel-based life cycle assessment approaches. PhD in Civil and Environmental Engineering. Carnegie Mellon University. 2012. *Thesis Committee: Paulina Jaramillo (Chair), W. Michael Griffin, H. Scott Matthews, Jeremy Michalek, and Mitchell Small.*
31. Eric Hittinger: Energy storage on the grid and the short-term variability of wind. Ph.D. in Engineering and Public Policy. Carnegie Mellon University. 2012. *Thesis Committee: Jay Apt (Chair), Jay Whitacre, Seth Blumsack (Penn State), and Paulina Jaramillo.*
32. Brandon Mauch: Managing Wind Power Forecast Uncertainty in Electric Grids. PhD in Engineering and Public Policy. Carnegie Mellon University. 2012. *Thesis Committee: Jay Apt (Chair), Pedro Carvalho, Paulina Jaramillo, Paul Fischback, and Marcelino Ferreira (Portugal).*

Master's Research

1. Pranav Gupta: Modeling demand for air conditioning in India under climate change. M.S. Energy, Science, Technology, and Policy. August 2020 to December 2021. Co-advisor: Aranya Venkatesh.
2. Santiago Amaya: REO-Kiln process for reduced CO₂ emissions from cement manufacturing. M.S. Civil and Environmental Engineering, June to December 2014.
3. DeVynne Farquharson: Analysis of climate metric for use in life cycle assessment. M.A. Energy Science, Technology, and Policy. June to December 2014. Co-advisor: Derrick Carlson.

Undergraduate Research

1. Frank Araujo and Jasmine Lim: Electricity demand for space air conditioning in Puerto Rico under climate change. August 2019 to May 2020.
2. Nikhita Singh: Analysis of changes on the social costs of air pollution from U.S. power plants between 2002-2011. Civil and Environmental Engineering, & Engineering and Public Policy, Summer 2016 to May 2017.
3. Miriam Hegglin: Trade-off analysis of energy efficient lighting technology. B.S. Civil and Environmental Engineering, & Engineering and Public Policy, Summer 2013.
4. Agnes Marszalik and Elissa Goldner: Local economic impacts of a wind energy project in Pennsylvania. B.S. Civil and Environmental Engineering, 2012-2013.
5. Anna Lenhart: A feasibility study of bio-gas digesters and composting systems for Carnegie Mellon University. B.S. Civil and Environmental Engineering, Spring 2011.

Post-Doctoral Researchers

1. Travis Carless. Ph.D. in Engineering and Public Policy from Carnegie Mellon University. Project: Risk analysis of small modular reactors. (August 2019- August 2020).
2. Mohsen Rahmani. Ph.D. in Power Systems from Universidade Estadual Paulista (Brazil). Project: Reliability implications of coal plant retirements in PJM. (June 2013 – December 2015). Co-Advisor: Gabriela Hug.
3. Derrick Carlson. Ph.D. in Civil and Environmental Engineering from Carnegie Mellon University. Project: Water supply curves in Texas. (December 2013 – August 2015).

TEACHING EXPERIENCE

Course Instructor

EPP Project - Fall 2013, Spring 2016.

This course is a capstone course for undergraduates majoring in Engineering and Public Policy or Social and Decision sciences. Two faculty members teach this course as an interdisciplinary project in which students analyze a complex “real-world” societal problem involving science and technology. Topics focus on current local, state, or national issues at the intersection of science, engineering, economics, public opinion, and policy. Students must analyze and integrate the various facets of the problem in order to produce useful results that will help a “client” make informed decisions. Results from the project are documented in a final oral presentation and a final written report of professional quality.

Sustainable Energy in the Developing World – Spring 2014, Spring 2015, Fall 2016, Spring 2018, Spring 2019, Spring 2020, Spring 2023.

This course examines the current state of the energy system in developing countries and the challenges these countries will face in sustainably meeting their energy needs in the 21st century. It also offers an introduction to methods available for analyzing energy alternatives, including engineering economics, life cycle assessment, and multi-attribute decision-making.

Decision Making Methods for Engineers and Scientists – Fall 2014, Fall 2015, Spring 2017, Fall 2017, Fall 2018, Fall 2019, Fall 2020, Fall 2021, Fall 2022.

This sophomore level course covers various economic, statistical, and decision analysis techniques used for examining complex decisions where technology, society, and policy interconnect. Topics covered include: estimation techniques, benefit-cost analysis, decision trees, dealing with uncertainty, risk perception and analysis, survey design and implementation, utility theory, heuristics and biases in inference and prediction, methods for combining information from different sources and dealing with conflicting objectives.

ICT Applications for Sustainable Development – Spring 2022.

In this project-based course, students identify opportunities for the deployment of ICTs to support the SDGs. Through the course students learn about the Sustainable Development Goals and analyze the generic contribution of ICTs to sustainable development. Students also analyze the role of policy, strategy, and operational interventions in promoting effective developmental use of ICTs; and the key roles, challenges to specific development goals. Finally, students apply a critical conceptual framework to analyze ICT for sustainable development evidence and practice.

Program Development and Instructor

Summer Engineering Experience for Girls – 2007-2014

Middle school girls introduced to engineering and its various fields with central focus on energy systems and the environment. Students meet for a two-week period in the summer with faculty and graduate students from various disciplines, includes a research and presentation component.

Green Design Apprenticeship – 2005-2009

Local high school students experience the issues and activities of Green Design engineers and researchers. Students meet one day per month over 5 months to learn about current research areas such as life cycle assessment, environmental impacts of energy consumption and electricity generation, and green building infrastructure.

ACADEMIC AND PROFESSIONAL SERVICE**Editor**

- Member of the editorial board for Environmental Research Letters. 2017 to present.
- Guest Associate and Review editor for Frontiers in Climate and Decision Making. 2021-present
- Materials for Energy: Energy, Economy and the Environment. MRS Bulletin. Guest editor for the Energy Quarterly, March 2011.

Journal Reviewer

Science; Proceedings of the National Academies of Science; Environmental Science and Technology; Energy Policy; Journal of Industrial Ecology; Wind Energy; International Journal of Sustainable Energy; Journal of the American Medical Association; Applied Energy, Energies.

Non-Journal Reviewer

- EPA STAR Fellowship proposal reviewer. 2015
- NSF Proposal Review Panel – Engineering Directorate. 2013, 2014, 2015, and 2016.
- World Health Organization. Social Determinants of Health Sectoral Briefing Series – Energy: Shared Interests in Sustainable Development and Well-Being. June 2013.
- USDA Small Business Innovation Research Program. February 2013.
- Swiss National Science Foundation. NCCR Pre-Proposal Process. May 2012.
- IPCC: Special Report on Renewable Energy Sources and Climate Change Mitigation. February 2012. Available at: http://srren.ipcc-wg3.de/report/IPCC_SRREN_Full_Report.pdf

University Service

- Search committee for new Department Head of Civil and Environmental Engineering. College of Engineering. Carnegie Mellon University. 2021-2022.
- Search committee for Senior Faculty in Electricity and Public. Department of Engineering and Public Policy. Carnegie Mellon University. 2021-2022.
- University tenure reappointment and promotion committee. Carnegie Mellon University. 2021-present
- Diversity, equity, and inclusion committee. College of Engineering. Carnegie Mellon University. 2017-2022
- Diversity, equity, and inclusion committee. Department of Engineering and Public Policy. Carnegie Mellon University. 2017 – 2023. (Chair, 2019-2022)
- Search committee for new Associate Dean for Diversity, Equity, and Inclusion. College of Engineering. Carnegie Mellon University. 2020.
- Research ecosystem committee. College of Engineering at Carnegie Mellon University. 2019 - 2020
- Search committee for new Department Head of Engineering and Public Policy. Carnegie Mellon University. 2019
- Search committee for new Dean of the College of Engineering. Carnegie Mellon University. 2019
- Non-tenure reappointment and promotion committee. Carnegie Mellon University. 2017-2019
- Curriculum Review Committee. College of Engineering. Carnegie Mellon University. 2017-2018
- Undergraduate Education Committee. Department of Engineering and Public Policy. Carnegie Mellon University. 2012 – 2019.
- Judge for Steinbrenner Undergraduate Environmental Research Award. May 2013 and May 2014.

Conferences and Workshops

- Organizer. Open Energy Outlook for the USA. Side event at the Global Clean Energy Action Forum. September 2022. Pittsburgh, PA.
- Organizer. Energy for Development in a Carbon-Constrained World (EDC2018). August 2018. London, England
- Scientific committee member. International Symposium for Sustainable Systems and Technology. May 2014. Oakland, CA.
- Contributor. NAS Workshop on the Development of Unconventional Hydrocarbon Resources in the Appalachian Basin. September 2013. Morgantown, WV.

- Organizer. Second Integration and Policy Workshop for the RenewElec Project. October 2011. Pittsburgh, PA.
- Organizer. First Integration and Policy Workshop for the RenewElec Project. October 2010. Pittsburgh, PA.

PROFESSIONAL AFFILIATIONS

- Scholars Strategy Network. 2024-present
- Faculty Affiliate of the Kigali Collaborative Research Center (Kigali, Rwanda). 2017-present
- Member of the American Geophysical Union, Tau Beta Pi Engineering Honor Society, Chi Epsilon Civil Engineering Honor Society, Society of Women Engineers, and Society of Hispanic Professional Engineers.