

Brian Tarroja, Ph.D., P.E.

Curriculum Vitae

Current Appointments:

University of California, Irvine:

1. **Associate Professional Researcher (I) / Full-Time**
Department of Civil and Environmental Engineering
2. **Lecturer / Part-Time**
Department of Mechanical & Aerospace Engineering
Department of Civil and Environmental Engineering
Program in University Studies
3. **Manager**, Energy Systems Integration Group
Advanced Power & Energy Program

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Citizenship: United States

Last Updated: April 17, 2024

Education:

University of California, Irvine

M.Sc. & Ph.D. Advisor: Scott Samuelsen

- Ph.D. in Mechanical and Aerospace Engineering (6/2014)
- M.Sc. in Mechanical and Aerospace Engineering (6/2011)
- B.Sc. in Mechanical Engineering, *Cum Laude* (6/2009)
 - Specialization: Energy Systems
- B.Sc. in Aerospace Engineering, *Cum Laude* (6/2009)
 - Minor: Materials Science Engineering

Licensure & Certifications:

- Professional Engineer (P.E.), Mechanical
State of California, License No. M38368 (12/2016)

Research Interests:

- Beneficial and robust co-optimization of electricity, transportation, & water infrastructure design
- Understanding energy infrastructure response to integration of new technologies
- Electric grid integration of alternative powertrain vehicles and renewable resources
- Environmental life cycle analysis of emerging energy, transportation, & water technologies
- Electric grid resource dispatch and planning for supporting renewable energy resources
- Climate change impacts on energy infrastructure operation and adaptation strategies

Professional Appointments & Experience:

Research & Professional Experience:

- **Associate Professional Researcher (PI Status)**
Civil and Environmental Engineering, University of California, Irvine (7/2022 – present)
 - Full-time, non-tenure track researcher position with Principal Investigator (PI) status
 - Leads original research in multiple areas of sustainable energy system design
 - Serves as PI and co-PI on original research grants and projects
 - Procures funding for original research ideas related to sustainable resource systems
 - Supervises research staff in original research related to sustainable resource systems
 - Mentors graduate students in research and academic career navigation
 - Title equivalent to “Associate Research Professor” outside the University of California system

- **Manager, Energy Systems Integration Group**
Advanced Power and Energy Program, University of California, Irvine (6/2018 - present)
 - Manages contractual obligations of research projects on energy systems integration and center relations with external entities

- **Assistant Professional Researcher (PI Status)**
Civil and Environmental Engineering, University of California, Irvine (11/2016 – 6/2022)
 - Full-time, non-tenure track researcher position with Principal Investigator (PI) status
 - Led original research in multiple areas of sustainable energy system design
 - Served as PI and co-PI on original research grants and projects
 - Procured funding for original research ideas related to sustainable resource systems
 - Supervised research staff in original research related to sustainable resource systems
 - Mentored graduate students in research and academic career navigation
 - Title equivalent to “Assistant Research Professor” outside the University of California system

- **Associate Manager of Sustainable Energy & Transportation**
Advanced Power and Energy Program, University of California, Irvine (8/2014 – 5/2018)
 - Managed contractual obligations of research projects and center relations

- **Senior Research Scientist**
Advanced Power and Energy Program, University of California, Irvine (8/2014 – 11/2016)
 - Full-time staff researcher position
 - Conducted original research in sustainable electricity, transportation, and water systems
 - Procured funding for original research ideas / projects and managed contractual obligations
 - Mentored graduate students in research and academic career navigation

- **Graduate Student Intern** (6/2012 – 9/2012)
California Air Resources Board
 - Authored an internal advisory report describing technical challenges and opportunities regarding satisfaction of California’s 33% Renewable Portfolio Standard (RPS) based on research findings for use in the AB 32 Scoping Plan 2013 Update.

- **Graduate Student Researcher** (7/2009 – 6/2014)
University of California, Irvine – Mechanical and Aerospace Engineering
 - Characterization of wind and solar power generation intermittency and grid impacts
 - Identifying potential obstacles for large-scale renewable electricity integration
 - Evaluating demand response, energy storage, smart electric vehicle charging as potential solutions
 - Characterizing and optimizing electricity system resource portfolios
 - Characterizing interactions between water resources and sustainable energy planning

- **Undergraduate Student Researcher** (1/2007 – 6/2009)
University of California, Irvine – National Fuel Cell Research Center
 - Thermodynamic design analysis of solid oxide fuel cell / gas turbine systems
 - Finite element modeling of thermal gradients and mechanical stresses in fuel cell-tri layers

Teaching Experience:

- **Lecturer** (3/2014 – present)
University of California, Irvine – Mechanical and Aerospace Engineering (2014-present)
University of California, Irvine – University Studies (2022-present)
University of California, Irvine – Civil and Environmental Engineering (2024-present)

<u>Course Code</u>	<u>Course Title</u>	<u>Quarters Taught</u>	<u>Avg. Instructor Rating**</u>
MAE 118	Sustainable Energy Systems (Undergraduate)	<u>Spring</u> : 2014, 2015, 2016 <u>Winter</u> : 2017, 2018, 2019, 2020, 2021, 2022	3.82 / 4.00
MAE 218	Sustainable Energy Systems (Graduate)	<u>Spring</u> : 2014, 2015, 2016 <u>Winter</u> : 2017, 2018, 2019, 2020, 2021, 2022	3.90 / 4.00
MAE 218P	Sustainable Energy Systems (M.Eng Professional Program)	<u>Winter</u> : 2021, 2022, 2023, 2024, 2025 (scheduled)	4.00 / 4.00
UNI STU H30F	Cities: Focal Point for Sustainability Problems and Solutions II	<u>Spring</u> : 2022, 2023, 2024	N/A
UNI STU H30E	Cities: Focal Point for Sustainability Problems and Solutions I	<u>Winter</u> : 2023, 2024	N/A
CEE 164	Carbon and Energy Footprint Analysis	<u>Spring</u> : 2024	N/A
CEE 201P	Life Cycle Assessment Methods (M.Eng Professional Program)	<u>Fall</u> : 2024 (scheduled)	N/A
CEE 203P	Organizational Pollutant Emissions Accounting (M.Eng Professional Program)	<u>Spring</u> : 2025 (scheduled)	N/A

**Numerical ratings were removed starting the 2021-2022 Academic Year.

Publications and Presentations:

Last Updated: April 17, 2024

- Citations: **1927** (via Google Scholar)
- h-index: **25** (via Google Scholar)
- i10-index: **32** (via Google Scholar)

Journal and conference publications are peer reviewed. Reports are reviewed by the entity to which they are submitted. * indicates corresponding author.

Refereed Journal Publications – Published or Accepted:

38. **Tarroja, B.***, Peer, R., Grubert, E., “Assessing how non-carbon co-priorities affect zero-carbon electricity system development in California under current policies”, *Journal of Cleaner Production*, 2023. 138633.
37. Rheinheimer, D., **Tarroja B.**, Rallings, A.M., Willis, A.D., Viers, J.H., “Hydropower representation in water and energy system models: A review of divergences and call for reconciliation”, *Environmental Research: Infrastructure and Sustainability*, 2023. **3** 012001.
36. Schichtel, B.A., Stevenson, E.D., Braun, G., Shaw, S.L., **Tarroja, B.**, Chao, C.C., "Circular economy for lithium-ion batteries and photovoltaic modules—status, challenges, and opportunities", *Journal of the Air and Waste Management Association*, 2022. **72**, p.1053-1062.
35. Forrest, K., Lane, B., **Tarroja, B.**, Mac Kinnon, M., Samuelsen, S., “Emissions and Air Quality Implications of Enabling On-Road Vehicles as Flexible Load through Widescale Zero Emission Vehicle Deployment in California”, *Transportation Research Record*, 2022.
34. He, H., Tian, S., Glaubenskle, C., **Tarroja B.**, Samuelsen, S., Ogunseitan, O., Schoenung, J.M., “Advancing chemical hazard assessment with decision analysis: A case study on lithium-ion and redox flow batteries used for energy storage”, *Journal of Hazardous Materials*, 2022. 129301.
33. Oikonomou, K., Kern, J., **Tarroja, B.**, Voisin, N., “Review of Core Process Representation in Power System Operational Models: Gaps, Challenges, and Opportunities for Multisector Dynamics Research”, *Energy*, 2021. 122049.
32. Wang, S., **Tarroja, B.***, Schell, L.S., Samuelsen, S., " Determining cost-optimal approaches for managing excess renewable electricity in decarbonized electricity systems", *Renewable Energy*, 2021. **178**, p.1187-1197.
31. Tian, S., He, H., Kendall, A., Davis, S.J., Ogunseitan, O., Schoenung, J.M., Samuelsen, S., **Tarroja, B.***, "Environmental Benefit-Detriment Thresholds for Flow Battery Energy Storage Systems: A Case Study in California", *Applied Energy*, 2021. **300**, 117354.
30. **Tarroja, B.***, Hittinger, E., “The value of consumer acceptance of controlled electric vehicle charging in a decarbonizing grid: The case of California”, *Energy*, 2021. **229**, 120691.
29. Qin, P., Xu, H., Liu, M., Xiao, C., Forrest, K., Samuelsen, S., **Tarroja, B.***, "Assessing concurrent effects of climate change on hydropower supply, electricity demand, and greenhouse gas emissions in the Upper Yangtze River Basin of China", *Applied Energy*. 2020. **279**, 115694.
28. Forrest, K., MacKinnon, M., **Tarroja, B.**, Samuelsen, S., "Estimating the Technical Feasibility of Zero-Emission Vehicles for the Medium and Heavy-Duty Vehicle Sectors in California", *Applied Energy*, 2020. **276**, 115439.

27. He, H., Tian, S., **Tarroja, B.**, Ogunseitan, O., Samuelson, S., Schoenung, J.M., "Flow Battery Production: Materials Selection and Environmental Impact", *Journal of Cleaner Production*, 2020. 269, 121740.
26. **Tarroja, B.***, Peer, R., Sanders, K.T., Grubert, E., "How do non-carbon priorities affect zero-carbon electricity systems? A case study of freshwater consumption and cost for SB100 compliance in California", *Applied Energy*, 2020. **265**, 114824.
25. Qin, P., Xu, H., Liu, M., Du, L., Xiao, C., Liu, L., **Tarroja, B.** "Climate change impacts on Three Gorges Reservoir impoundment and hydropower generation", *Journal of Hydrology*, 2020. **580**, 123922.
24. **Tarroja, B.***, Forrest, K., Chiang, F., AghaKouchak, A., Samuelson, S. "Implications of Hydropower Variability from Climate Change for Design and Operation of a Future, Highly-Renewable Electric Grid in California", *Applied Energy*, 2019. **237**, p.353-366.
23. Wang, S., **Tarroja, B.***, Schell, L.S., Shaffer, B., and Samuelson, S., "Prioritizing Among the End-Uses of Excess Renewable Energy for Cost-Effective GHG Emissions Reductions", *Applied Energy*, 2019. **235**, p. 284-298.
 - Selected for Progress in Applied Energy feature section
22. Forrest, K., **Tarroja, B.***, Chiang, F., AghaKouchak, A., and Samuelson, S., "Assessing Climate Change Impacts on California Hydropower Generation and Ancillary Services Provision", *Climatic Change*, 2018. **151**: p.395-412.
21. Cheng, A.J., **Tarroja, B.***, Shaffer, B., Samuelson, S., "Comparing the emissions benefits of centralized vs. decentralized electric vehicle smart charging approaches: A case study of the year 2030 California electric grid", *Journal of Power Sources*, 2018. **401**: p.175-185.
20. **Tarroja, B.***, Chiang, F., AghaKouchak, A., and Samuelson, S., "Assessing future water resource constraints on thermally based renewable energy resources in California", *Applied Energy*, 2018. **226**: p. 49-60.
19. **Tarroja, B.***, Chiang, F., AghaKouchak, A., Samuelson, S., Raghavan, S.V., Wei, M., Sun, K., and Hong, T., "Translating climate change and heating system electrification impacts on building energy use to future greenhouse gas emissions and electric grid capacity requirements in California", *Applied Energy*, 2018. **225**: p. 522-534.
 - Selected for Progress in Applied Energy feature section
18. **Tarroja, B.***, Shaffer, B.P., and Samuelson, S., "Resource portfolio design considerations for materially-efficient planning of 100% renewable electricity systems", *Energy*, 2018. **157**: p. 460-471.
17. Hardin, E., AghaKouchak, A., Qomi, M.J.A, Madani, K., **Tarroja, B.**, Zhou, Y., Yang, T., Samuelson, S., "California Drought Increases CO₂ Footprint of Energy Production", *Sustainable Cities and Society*, 2017, **28**: p.450-452.
16. Forrest, K., **Tarroja, B.***, Zhang, L., Shaffer, B., Samuelson, S., "Charging a Renewable Future: The Impact of EV Charging Intelligence on Energy Storage Requirements for Renewable Portfolio Standards", *Journal of Power Sources*, 2016, **336**: p.63-74.

15. **Tarroja, B.***, AghaKouchak, A., Samuelsen, S., “Quantifying the Implications of Climate-Change Impacted Hydropower on Electric Grid Greenhouse Gas Emissions and Operation”, *Energy*, 2016. **111**: p.295-305.
14. **Tarroja B.***, Zhang, L., Wifvat, T., Shaffer, B., Samuelsen, S., “Assessing the Stationary Energy Storage Equivalency of Vehicle-to-Grid Charging Battery Electric Vehicles”, *Energy*, 2016. **106**: p.673-690.
13. Forrest, K., Shaffer, B., **Tarroja, B.**, Samuelsen, S., “A Comparison of Fuel Cell and Energy Storage Technologies' Potential to Reduce CO₂ Emissions and Meet Renewable Generation Goals”, *ECS Transactions*, 2016. **71**(1), p.193-203.
12. **Tarroja, B.***, Shaffer, B., Samuelsen, S., “The Importance of Grid Integration for Achievable Greenhouse Gas Emissions Reductions from Alternative Vehicle Technologies”, *Energy*, 2015. **87**: p.504-519
11. Shaffer, B., **Tarroja, B.**, Samuelsen, S., “Dispatch of Fuel Cells as Transmission Integrated Grid Energy Resources”, *Applied Energy*, 2015. **148**: p.178-186
10. **Tarroja, B.**, AghaKouchak, A., Samuelsen, S., Sobhani, R., Feldman, D., Jiang, C.S., “Evaluating Options for Balancing the Water-Electricity Nexus in California: Part 2 – Greenhouse Gas and Renewable Energy Utilization Impacts”, *Science of the Total Environment*, 2014. **497-498**: p.711-724
9. **Tarroja, B.**, AghaKouchak, A., Samuelsen, S., Sobhani, R., Feldman, D., Jiang, C.S., “Evaluating Options for Balancing the Water-Electricity Nexus in California: Part 1 – Securing Water Availability”, *Science of the Total Environment*, 2014. **497-498**: p.697-710
8. **Tarroja, B.**, Eichman, J.D., Zhang, L., Brown, T., Samuelsen, S., “The Effectiveness of Plug-in Hybrid Electric Vehicles and Renewable Power in Support of Holistic Environmental Goals: Part 2 – Design and Operation Implications for Load-Balancing Resources on the Electric Grid”, *Journal of Power Sources*, 2014. **278**: p.782-793
7. **Tarroja, B.**, Eichman, J.D., Zhang, L., Brown, T., Samuelsen, S., “The Effectiveness of Plug-in Hybrid Electric Vehicles and Renewable Power in Support of Holistic Environmental Goals: Part 1 - Evaluation of Aggregate Energy and Greenhouse Gas Performance”, *Journal of Power Sources*, 2014. **257**(1): p.461-470
6. Eichman, J.D., Mueller, F., **Tarroja, B.**, Schell, L.S., Samuelsen, S., “Exploration of the integration of renewable resources into California's electric system using the Holistic Grid Resource Integration and Deployment (HiGRID) tool”, *Energy*, 2013. **50**(1): p. 353-363
5. **Tarroja, B.**, Mueller, F., Eichman, J.D., Samuelsen, S., “Metrics for Evaluating the Impacts of Intermittent Renewable Generation on Utility Load-Balancing with a Case Study in California.” *Energy*, 2012. **42**(1): p. 546-562
4. **Tarroja, B.**, Mueller, F., Samuelsen, S., “Solar power variability and spatial diversification: implications from an electric grid load balancing perspective”, *Wiley International Journal of Energy Research*, 2012. **37**(9): p.1002-1016.
3. **Tarroja, B.**, F. Mueller, J.D. Eichman, J. Brouwer, and S. Samuelsen, “Spatial and temporal analysis of electric wind generation intermittency and dynamics”. *Renewable Energy*, 2011. **36**(12): p. 3424-3432.

2. Mueller, F., **Tarroja, B.J.**, Maclay, J.D., Jabbari, F., Brouwer, J., Samuelsen, S., "Design, Simulation and Control of a 100 Megawatt-Class Solid Oxide Fuel Cell Gas Turbine Hybrid System", *ASME Journal of Fuel Cell Science and Technology*, June 2010, Vol.7, Issue 3.
1. **Tarroja, B.J.**, Mueller, F., Maclay, J.D., Brouwer, J., "Parametric Thermodynamic Analysis of a Pure Hydrogen Solid Oxide Fuel Cell Gas Turbine System Design Space". *ASME Journal for Engineering of Gas Turbines and Power*, July 2010, Vol. 132, Issue 7.

Refereed Journal Publications – Submitted / Under Review:

Under Review: Paper has been formally submitted to a peer-reviewed journal and sent out for peer review.

Submitted: Paper manuscript has been formally submitted to a peer-reviewed journal but has not yet been sent out for peer review.

1. **Tarroja B.**, Schoenung, J.M., Ogunseitan, O., Kendall, A., Qiu, Y., Malloy, T., Peters, J., Mijin Cha, J., Mulvaney, D., Heidrich, O., Baumann, M., "Overcoming Barriers to Improved Decision-Making for Sustainable Large-Scale Battery Deployment". **Revised Manuscript Under Review**
2. **Tarroja B.**, Forrest, K., Yamada, K., Saha, R., Hyland, M., "Estimating the Electricity System Benefits of Shifting Trips to Electric Bikes from Battery Electric Vehicles: A Case Study for California". **Initial Manuscript Submitted**

Books and Book Chapters

1. **Tarroja B.**, Ogunseitan, O., Kendall, A., "Life Cycle Assessment of Emerging Battery Systems". in *Emerging Battery Technologies to Boost the Clean Energy Transition*, eds. Passerini, S., Barelli, L., Baumann, M., Peters, J., and Weil, M. Springer, 2024, p. 243-258.

Reports and Report Sections:

7. **Tarroja B.**, Samuelsen, S., "Cost Benefit Analysis of Additional Energy Storage Procurement". 2023. Prepared for the California Public Utilities Commission under Subaward CP508A.
6. **Tarroja, B.**, He, H., Tian, S., Ogunseitan, O., Schoenung, J.M., Samuelsen, S., "Life Cycle Assessment of Environmental and Human Health Impacts of Flow Battery Energy Storage Production and Use", December 2021. California Energy Commission. Publication number: CEC-500-2021-051.
5. Castro, C., Dowling, J., Dehghanian, P., Gencer, E., Kammen, D., Logan, J., Mauter, M., **Tarroja, B.**, Wagner, G., Victor, D., Bazilian, M., "Accelerating Deep Decarbonization in the U.S. Power Sector", Section of the America's Zero Carbon Action Plan, October 2020. U.N. Sustainable Development Solutions Network.
4. Munoz, A., **Tarroja, B.**, Samuelsen, S., "Life Cycle Assessment of Environmental and Economic Impacts of Deploying Alternative Urban Bus Powertrain Technologies in the South Coast Air Basin. December 2018. Pacific Southwest Region University Transportation Center (PSR-UTC).
3. **Tarroja, B.**, Samuelsen, S., AghaKouchak, A., Feldman, D., Forrest, K., Chiang, F., Advanced Power and Energy Program, UC Irvine. "Building a Climate Change-Resilient Electricity System for Meeting California's Energy and Environmental Goals", March 2014. California Energy Commission. Publication number: CEC-500-2019-015.
2. **Tarroja B.**, Jenkins, S., Berger, M.A., Chiang, L., "Capturing the Benefits of Integrated Resource Management for Water & Electricity Utilities and their Partners". U.S. Department of Energy and the University of California, May 2016.

- Report from the UC/DOE Workshop on the Water-Energy Nexus, May 28-29, 2015 at UC Irvine.
1. Samuelsen, S., Mueller, F., Eichman, J., **Tarroja, B.** Advanced Power and Energy Program, UC Irvine. “Piloting the Integration and Utilization of Renewables to Achieve a Flexible and Secure Energy Infrastructure”, March 2014. California Energy Commission. Publication number: CEC-500-2015-075.
 - Listed as an “Exceptional Project” by the CEC.

Refereed Conference Publications:

7. He, H., Tian, S., Glaubenskle, C., **Tarroja B.**, Samuelsen, S., Ogunseitan, O., Schoenung, J.M., “Techno-Economic Analysis of Material Costs for Emerging Flow Batteries”, REWAS 2022: Developing Tomorrow’s Technical Cycles (Volume 1), 2022. p.449-460.
6. He, H., Tian, S., Glaubenskle, C., **Tarroja B.**, Samuelsen, S., Ogunseitan, O., Schoenung, J.M., “Potential Health Impact Assessment of Large-Scale Production of Batteries for the Electric Grid”, REWAS 2022: Developing Tomorrow’s Technical Cycles (Volume 1), 2022. p.417-425
5. Shaffer, B., **Tarroja, B.**, Samuelsen, S., “Advancing Toward Sustainability Goals at the University of California, Irvine”, *ASME 2014 9th International Conference on Energy Sustainability*, Boston, Massachusetts, 30 June – 2 July 2014
4. **Tarroja, B.**, Mueller, F., Pratt, J.W., Brouwer, J., “Thermodynamic Design Analysis of a Solid Oxide Fuel Cell Gas Turbine Hybrid System for High-Altitude Aerospace Applications”, *7th Annual International Energy Conversion Engineering Conference*, Denver, Colorado, 2 - 5 Aug 2009
3. Mueller, F., **Tarroja, B.**, “High Temperature Stationary Solid Oxide Fuel Cell Systems In the Renewable Future”, *7th International ASME Fuel Cell Science, Engineering, and Technology Conference*, Newport Beach, California, 8-10 June 2009
2. Mueller, F., **Tarroja, B.**, Maclay, J.D., Jabbari, F., Brouwer, J., Samuelsen, S., “Design, Simulation and Control of a 100 Megawatt-Class Solid Oxide Fuel Cell Gas Turbine Hybrid System”, *6th International ASME Fuel Cell Science, Engineering, and Technology Conference*, Denver, Colorado, 16-18 June 2008
1. **Tarroja, B.**, Mueller, F., Maclay, J.D., Brouwer, J., “Parametric Thermodynamic Analysis of a Pure Hydrogen Solid Oxide Fuel Cell Gas Turbine System Design Space”, *ASME Gas Turbine Exposition 2008: Power for Sea, Land and Air*, Berlin, Germany, 9-13 June 2008

Media Publications:

2. **Brian Tarroja**, “Hydroelectric drought: How climate change complicates California’s plans for a carbon-free future.” *Bulletin of the Atomic Scientists*, August 16, 2021.
1. **Brian Tarroja**, David L. Feldman, “Time to Cross the Water-Energy Divide.” *SOURCE Magazine*, American Water Works Association CA-NV Section, Summer 2017 Issue.

Thesis and Dissertation:

2. **Tarroja, B.** “Advising and Optimizing the Deployment of Sustainability-Oriented Technologies in the Integrated Electricity, Light-Duty Transportation, and Water Supply System”, Doctoral Dissertation (PhD.), Mechanical and Aerospace Engineering, University of California – Irvine, June 2014.

1. **Tarroja, B.** “Characterization and Evaluation of Utility-Scale Intermittent Renewable Generation Variations and Implications for Electric Grid Load Balancing”, Masters of Science Thesis (M.Sc), Mechanical and Aerospace Engineering, University of California – Irvine, June 2011.

Refereed Conference Presentations:

23. **Brian Tarroja**, Dustin Mulvaney, Rebecca Peer, Emily Grubert, “Maximizing the Life Cycle Greenhouse Gas Emissions Reductions from Electricity Resource Portfolios”, *2023 American Geophysical Union Fall Meeting*, Chicago, IL, 15 December 2023
22. **Brian Tarroja**, Rebecca Peer, Emily Grubert, “Comparing the Development of Decarbonized Electricity Systems under Different Environmental Co-Priorities: A California Case Study”, *2022 American Geophysical Union Fall Meeting*, Chicago, IL, 13 December 2022.
21. **Brian Tarroja**, Greg Rhodes, “Exploring the role of flexible geothermal electricity resources in developing cost-effective decarbonized electricity grids”, *2021 MIT A+B Symposium*, Cambridge, MA, USA. 11 August, 2021.
20. **Brian Tarroja**, Shan Tian, Haoyang He, Julie Schoenung Oladele Ogunseitan, Scott Samuelson, “Energy Storage and Zero Emissions Energy: Balancing In-Operation Emissions Benefits vs. Life Cycle Emissions Impacts”, *2019 American Geophysical Union Fall Meeting*, San Francisco, CA, USA, 10 December 2019.
19. Haoyang He, Shan Tian, Christopher Glaubenslee, **Brian Tarroja**, Scott Samuelson, Oladele Ogunseitan, Julie Schoenung, “Flow Batteries for Renewable Energy Storage in the Grid: An Investigation into the Potential Human Health Impacts of Materials and Manufacturing”, *SETAC North America 40th Annual Meeting*, Toronto, Canada, 7 November 2019.
18. Haoyang He, Shan Tian, **Brian Tarroja**, Oladele Ogunseitan, Scott Samuelson, Julie M Schoenung, “A Life Cycle Analysis of Flow Battery Technologies Based on Manufacturer Specifications”, *2019 MRS Spring Meeting*, Phoenix, AZ, USA, 24 April 2019.
17. **Brian Tarroja**, “Flow Battery Energy Storage: A Flexible, Scalable Microgrid Management Resource?”, *International Colloquium for Environmentally Preferred Advanced Generation 2019: Microgrid Global Summit*, Irvine, CA, USA, 26 March 2019.
16. Kate Forrest, **Brian Tarroja**, Felicia Chiang, Amir AghaKouchak, Scott Samuelson, “Implications of Hydropower Variability from Climate Change for Design and Operation of a Future, Highly-Renewable Electric Grid in California”, *2018 American Geophysical Union Fall Meeting*, Washington, DC, USA, 12 December 2018.
15. **Brian Tarroja**, Felicia Chiang, Amir AghaKouchak, Scott Samuelson, Shuba Raghavan, Max Wei, Kaiyu Sun, Tianzhen Hong, “Understanding the Response of a Future Electric Grid in California to Climate Change Impacts on Building Energy Demand”, *2018 American Geophysical Union Fall Meeting*, Washington, DC, USA, 11 December 2018.
14. **Brian Tarroja**, Amir AghaKouchak, Kate Forrest, Scott Samuelson, “Unraveling the Importance of Climate Change Resilience in Planning the Future Sustainable Energy System”, *2017 American Geophysical Union Fall Meeting*, New Orleans, LA, USA, 14 December 2017.
13. **Brian Tarroja**, Haoyang He, Oladele Ogunseitan, Scott Samuelson, Julie M Schoenung, “Materials Efficiency in the Sustainable Energy Transition – The Case of Flow Battery Energy Storage”, *2017 MRS Fall Meeting*, Boston, MA, USA, 28 November 2017.

12. **Brian Tarroja**, Amir AghaKouchak, Kate Forrest, Scott Samuelson, “The Moving Target of Climate Change: Examples from the California Energy Sector”, *2016 American Geophysical Union Fall Meeting*, San Francisco, CA, USA, 14 December 2016.
11. **Brian Tarroja**, “The Role of V2G in the Context of Microgrids”, *International Colloquium for Environmentally Preferred Advanced Generation 2016: Microgrid Global Summit*, Irvine, CA, USA, 23 March 2016.
10. **Brian Tarroja**, Amir AghaKouchak, Scott Samuelson, “Developing Water Resource Security in a Greenhouse Gas Constrained Context: A Case Study in California”, *2015 American Geophysical Union Fall Meeting*, San Francisco, CA, USA, 16 December 2015.
9. Kate Forrest, Brendan Shaffer, **Brian Tarroja**, G. Scott Samuelson, “Fuel Cell and Energy Storage Technologies to Support Greenhouse Gas Emission Reduction Goals”, *Fuel Cell Seminar 2015*, Los Angeles, CA, USA, 17 November 2015.
8. **Brian Tarroja**, “The Greenhouse Gas Intensity of Alternative Water Resources”, *ASME Power & Energy 2015*, San Diego, CA, USA, 2 July 2015.
7. **Brian Tarroja**, “Holistic Sustainability Analyses: Evaluating Pathways to Meet California’s 2050 Greenhouse Gas Reduction and Water Supply Security Goals”, *International Colloquium for Environmentally Preferred Advanced Power Generation 2014*, Newport Beach, CA, USA, 2 April 2014.
6. **Brian Tarroja**, “Impacts of PEVs on California’s Future Electric Grid”, *International Colloquium for Environmentally Preferred Advanced Power Generation 2013*, Newport Beach, CA, USA, 23 April 2013.
5. **Brian Tarroja**, “Ability of Complementary Technologies to Mitigate Renewable Intermittencies”, *International Colloquium for Environmentally Preferred Advanced Power Generation 2013*, Newport Beach, CA, USA, 23 April 2013.
4. **Brian Tarroja**, “Evaluation of Differing Photovoltaic Technologies in Parallel Platforms”, *International Colloquium for Environmentally Preferred Advanced Power Generation 2012*, Costa Mesa, CA, USA, 7 February 2012.
3. **Brian Tarroja**, “Implications of the Spatial Diversification of Renewable Power Installations”, *International Colloquium for Environmentally Preferred Advanced Power Generation 2011*, Costa Mesa, CA, USA, 8 February 2011.
2. **Brian Tarroja**, “Thermodynamic Design Analysis of a Solid Oxide Fuel Cell Gas Turbine Hybrid System for High-Altitude Aerospace Applications”, *7th Annual International Energy Conversion Engineering Conference*, Denver, Colorado, USA, 2 - 5 August 2009
1. **Brian J. Tarroja**, “Parametric Thermodynamic Analysis of a Solid Oxide Fuel Cell Gas Turbine System Design Space.” *ASME Gas Turbine Exposition 2008: Power for Sea, Land and Air*, Berlin, Germany, 10 June 2008.

Refereed Conference Posters:

6. **Brian Tarroja**, Rebecca Peer, Kelly Sanders, Emily Grubert, “Assessing the influence of freshwater consumption priorities on zero-carbon electricity planning: A case of Senate Bill 100 compliance in California”, *2020 American Geophysical Union Fall Meeting*, Remote due to COVID-19. December 2020.

5. Aditya Sood, David E Rheinheimer, Alan Cai, Anna Rallings, Dan Tran, **Brian Tarroja**, Joshua H Viers, “Assessing Climate Change Impact on System-wide Water Allocation Trade-offs for California’s San Joaquin River System”, *2019 American Geophysical Union Fall Meeting*, San Francisco, CA, USA, 9 December 2019.
4. Kate Forrest, Michael Mac Kinnon, **Brian Tarroja**, Scott Samuelsen, “Heavy-Duty Zero-Emission Vehicles for the Support of a Near-Zero Emission Energy System in California”, *2018 American Geophysical Union Fall Meeting*, Washington, DC, USA, 11 December 2019.
3. **Brian Tarroja**, Amir AghaKouchak, Kate Forrest, Felicia Chiang, Scott Samuelsen, “Assessing Climate Change Impacts on Resource Planning for Low-Carbon Energy System Development”, *2018 California Energy Commission EPIC Symposium*, Sacramento, CA, USA, 7 February 2018.
2. Kate Forrest, **Brian Tarroja**, Amir AghaKouchak, Felicia Chiang, Scott Samuelsen, “Investigating the Impact of Climate Change on Hydroelectric Generation and Ancillary Services in California”, *2017 American Geophysical Union Fall Meeting*, New Orleans, LA, USA, 14 December 2017.
1. **Brian Tarroja**, Amir AghaKouchak, Kate Forrest, Felicia Chiang, Scott Samuelsen, “Assessing Climate Impacts on Clean Energy Deployment Strategies – Examples from California”, *California Climate Change Symposium 2017*, Sacramento, CA, USA, 25 January 2017.

Invited Talks / Panels:

19. **Brian Tarroja**, Rebecca Peer, Emily Grubert, “Exploring Zero-Carbon Electricity System Planning Under Different Non-Carbon Co-Priorities in California”. INFORMS Annual Meeting 2023, 16 October 2023.
18. **Brian Tarroja**, Panelist (1 of 4), “Assessing and Tracking Progress Towards Circular Economy for Decision-Making”, Air and Waste Management Association Annual Meeting 2022, 30 June 2022.
17. **Brian Tarroja**, “Implications of Climate Change for Decarbonized Electricity System Planning: Examples From California”, INFORMS Annual Meeting 2021, 25 October 2021.
16. **Brian Tarroja**, Panelist (1 of 4), “Closing Plenary: Conversation between industrial ecology and marginal emissions factor researchers” International Society for Industrial Ecology, Industrial Ecology Day 2021, 21 June 2021.
15. **Brian Tarroja**, Panelist (1 of 6), “Early Career opportunities and new paths of research and development for net-zero energy systems, CO2 capture and conversion, difficult to decarbonize sectors, energy conversion and grid storage”, Secondary panel at UCI Engineering Dean’s Distinguished Lecture Event, 3 May 2021.
14. **Brian Tarroja**, “Determining the Role of Energy Storage in Zero-Emission Energy Systems: Assessing and Comparing Environmental Benefits and Impacts at Scale”, UC Davis Energy Graduate Group Seminar Series, 11 October 2019. Video here: https://youtu.be/5r61e4We_oU
13. **Brian Tarroja**, “Navigating the Design Space of Trajectories toward Low/Zero-Carbon Energy Systems in California”, UC Santa Barbara Institute of Energy Efficiency Annual Technology Review, 16 May 2019.
12. **Brian Tarroja**, “Capturing Hydropower Integration into an Evolving Electric Grid”, U.S. Department of Energy Hydropower Flexibility Workshop, 7 March 2019.

11. **Brian Tarroja**, “Opportunities for Water Infrastructure as a Key Asset of a Future, Sustainable Energy System”, UC Irvine Civil and Environmental Engineering Affiliates Meeting, 1 March 2019.
10. **Brian Tarroja**, Panelist (1 of 4), *Water and Energy Utilities Discuss: The Water-Energy Nexus*, Water UCI, 26 February 2019.
9. **Brian Tarroja**, “Characterizing and Mitigating Unintended Consequences of Sustainable Energy Infrastructure Development: Examples from California”, Pacific Northwest National Laboratory Energy and Environmental Directorate Seminar, Richland, WA, USA, 21 February 2019.
8. **Brian Tarroja**, “Identifying and Avoiding Unintended Consequences of Sustainable Energy & Water Infrastructure Development” University of San Diego Engineering Seminar, San Diego, CA, USA, 8 March 2018.
7. **Brian Tarroja**, “Identifying and Avoiding Unintended Consequences of Sustainable Infrastructure Development: Examples from the Energy and Water Sectors”, UC Merced Environmental Systems Seminar, Merced, CA, USA, 1 March 2018.
6. **Brian Tarroja**, Renewable Energy Panelist (1 of 3), *Letting Evidence Lead the Way – A Public Forum on Science Policy*, UC Irvine Science Policy Group and Union of Concerned Scientists, Irvine, CA, USA, 18 January 2018
5. **Brian Tarroja**, “Why Smart Charging? The Role of Smart Charging EV Integration in Increasingly Renewable Grids”, 4th Demand Response and Distributed Energy Resources World Forum, Costa Mesa, CA, USA, 12 October 2017.
4. **Brian Tarroja**, Expert Panel Member (1 of 6), *Water-Energy Workshop*, Southern California Water Committee, Anaheim, CA, USA, 22 June 2016.
3. **Brian Tarroja**, “Connecting the Dots: Advising the Sustainable Development of Large-Scale Integrated Resource Systems”, *Mechanical Engineering Department Seminar*, UC Merced, Merced, CA, USA, 1 February 2016.
2. **Brian Tarroja**, “Green Engineering in the Sustainable Energy Context”, Guest Lecture, *CBEMS 249 - Green Engineering*, Chemical and Biological Engineering and Materials Science Department, UC Irvine, Irvine, CA, USA, 5 November 2015.
1. **Brian Tarroja**, “Transition to a Low-Carbon Economy: Air Quality Considerations”, *2015 Integrated Energy Policy Report (IEPR)*, California Energy Commission, Sacramento, CA, USA, 24 July 2015.

Research Funding & Grants:

As Lead Principal Investigator (PI):

Funding Agency	Grant Title	Role	Funding	Notes	Duration
National Alliance for Water Innovation (NAWI)	<i>Evaluating the Value of Grid-Responsive Flexible Desalination</i>	Principal Investigator	\$546,540	Co-PI: Diego Rosso	10/2023 – 9/2025
California Public Utilities Commission	<i>Cost-Benefit Analysis of Additional Energy Storage Procurement</i>	Principal Investigator	\$180,000	Sole PI	10/2021-9/2022
Breakthrough Energy Sciences	<i>Development and Integration of Open-Source Transportation Electrification and Load Flexibility Tools</i>	Principal Investigator	\$296,080	Sole PI	10/2020-2/2023
National Renewable Energy Laboratory	<i>Characterizing the Role of Flexible Geothermal Resources in Supporting Decarbonized Electricity Grids</i>	Principal Investigator	\$49,394	Sole PI Subcontract under the U.S. DOE GETEM Program	2/2021-9/2021
University of California Office of the President	<i>Multi-Campus Research Programs and Initiatives (MRPI): Maximizing the Environmental Utility of Battery Energy Storage</i>	Principal Investigator	\$270,000	Co-PIs: J.M. Schoenung O.A. Ogunseitan S. Samuelsen A. Kendall (UCD) S. Suh (UCSB) T. Malloy (UCLA)	1/2019-12/2021
Pacific Northwest National Laboratory	<i>IM3 Energy-Water Dynamics Collaborative Task 6: Model intercomparison to inform the development of open source, grid scale, power system simulation tools</i>	Principal Investigator	\$75,000	Sole PI	1/2020-9/2020
California Energy Commission	<i>A Comparative, Comprehensive Life Cycle Assessment of the Environmental and Human Health Impacts of Emerging Energy Storage Technology Deployment</i>	Principal Investigator	\$600,000	Co-PIs: J.M. Schoenung O.A. Ogunseitan S. Samuelsen	6/2017-8/2020

As Co-Principal Investigator (Co-PI):

Funding Agency	Grant Title	Role	Funding	Notes	Duration
California Energy Commission	<i>Balancing Ecological & Energy Needs in California's Water Resources</i>	Co-Principal Investigator	\$93,750 (UCI Portion)	Total Funding: \$500,000 Lead PI: Joshua Viers (UC Merced)	7/2024 – 12/2026
Sloan Foundation	<i>Quantifying the Benefits and Constraints of Plug-In Electric Vehicle Smart Charging Adoption</i>	Co-Principal Investigator	\$181,739 (UCI Portion)	Total Funding: \$516,667 Lead PI: John Helveston (GWU) Other Co-PIs: Eric Hittinger (RIT), Alan Jenn (UC Davis)	9/2023 – 11/2026
University Transportation Center – Pacific Southwest Region (PSR-UTC)	<i>Quantifying the Electric Grid Cost Savings of Increasing E-Bike Mode Share</i>	Co-Principal Investigator	\$95,282	Lead PI: Michael Hyland	9/2022-8/2023
U.S. Department of Energy	<i>Identifying Hydropower Operational Flexibilities in Presence of Streamflow and Net-load Uncertainty</i>	Co-Principal Investigator	\$872,328	Lead PI: Soroosh Sorooshian	7/2020-6/2023
South Coast Air Quality Management District	<i>Integration of HiGRID into the Net Emissions Analysis Tool (NEAT)</i>	Co-Principal Investigator	\$75,000	Lead PI: Scott Samuelsen	8/2019-6/2020
University Transportation Center – Pacific Southwest Region (PSR-UTC)	<i>Life Cycle Assessment of Environmental and Economic Impacts of Deploying Alternative Urban Bus Powertrain Technologies in the South Coast Air Basin</i>	Co-Principal Investigator	\$53,837	Lead PI: Scott Samuelsen	1/2018-12/2018
South Coast Air Quality Management District	<i>Demonstration and Evaluation of a Plug-in Electric Vehicle Smart Charging Algorithm at Multiple Electric Grid Scales</i>	Co-Principal Investigator	\$250,000	Lead PI: Scott Samuelsen	8/2016-8/2018
California Energy Commission	<i>Building a Climate Change Resilient Electricity System for Meeting California's Energy and Environmental Goals</i>	Co-Principal Investigator, Technical Lead	\$998,792	Lead PI: Scott Samuelsen Amount includes \$300k cash cost share	7/2015-7/2018

Southern California Gas Company	<i>Exploration of the Role of Power-to-Gas (P2G) in Renewable Electricity Systems</i>	Co-Principal Investigator	\$250,000	Lead PI: Scott Samuelson	2/2016-8/2017
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As Senior Personnel:

Funding Agency	Grant Title	Role	Funding	Notes	Duration
U.S. Department of Energy	<i>Deployment of a Novel Large Scale Zinc Battery for National Security Resilience Scoping Study</i>	Senior Personnel	\$250,000 (UCI Portion)	Total Funding: \$16.6M Lead PI: Babu Chalamala (Sandia National Laboratory) UCI PI: David Copp	11/2023 - 4/2027
National Alliance for Water Innovation	<i>Process Twins for Decision-Support and Dynamic Energy/Cost Prediction in Water Reuse Processes</i>	Senior Personnel	\$999,304 (UCI Portion)	Lead PI: Diego Rosso	4/2022-3/2024
U.S. Department of Energy	<i>Electric Grid Reliability and Greenhouse Gas Implications of Climate Change-Impacted Hydropower Resources</i>	Senior Personnel	\$550,000 (UCI Portion)	Sub-award under the UC-wide CERC-WET grant.	10/2015-10/2020

Awards:

Honor Societies

- Pi Tau Sigma, Tau Beta Pi, Sigma Gamma Tau

Fellowships and Scholarships

- UC Irvine Distinguished Public Impact Fellow (2014)
- Association of Energy Engineers Scholar (2014)
- Association of Energy Engineers Dennis Acton Memorial Scholar (2013)
- National Science Foundation Graduate Research Fellow (2010 - 2013)
- U.S. Department of Education GAANN Fellow (2009)

Other

- Professor of the Year Award, Civil and Environmental Engineering Engineering Student Council at UC Irvine (2020)
- UC Irvine Staff Appreciation Award (2016)

Skills:

Software Packages

- Skilled: MATLAB, Engineering Equation Solver, Microsoft Office (Word, PowerPoint, Excel, Visio)
- Proficient: SimaPro, OpenLCA, Simulink, COMSOL Multiphysics, PLEXOS, ESRI ArcGIS, Python

Synergistic Activities:

Student Mentorship

- Provided day-to-day mentoring of the following graduate students in conducting and conceptualizing research work and ideas:
 - Kate E. Forrest – M.S: Environmental Engineering (2016) / PhD (2019)
 - Sarah M. Wang – M.S: Environmental Engineering (2017) / PhD: (2020)
 - Aaron Cheng – M.S: Mechanical Engineering (2018)
 - Shan Tian – M.S: Mechanical Engineering (2020)
 - Joliette Li – M.S: Environmental Engineering (2021)
 - Margaret Houck – M.S: Environmental Engineering (2022)
 - Joseph Suratt – M.S: Mechanical Engineering (2023)

Graduate Student Committee Service

- PhD. Qualifying Exam Committee Member:
 - Jessica Dunn, Energy Graduate Group, University of California Davis (3/2021)
- PhD. Dissertation Committee Member:
 - Jessica Dunn, Energy Graduate Group, University of California Davis (8/2022)

Department Service

- Civil and Environmental Masters of Engineering (M.Eng) Committee (9/2022 – present)
 - Assisted in developing a CEE M.Eng track in Sustainable Infrastructure
 - Assisted in developing a CEE M.Eng track in Data Science for Civil Engineers

Professional Society Membership

- American Society of Mechanical Engineers
- American Geophysical Union
- Water Environment Federation
- Institute for Operations Research and the Management Sciences

External Projects

- UN Sustainable Development Solutions Network, US Deep Decarbonization Action Plan – Power Generation Committee Member/Co-Author
- Led a task force for determining recommendations for approaching water-energy nexus issues based on discussions from the UC/DOE Water-Energy Nexus Workshop on 5/28-5/29.

Conference Service

- International Colloquium for Environmentally Preferred Advanced Generation 2015, Session Chair
- WEFTEC 2020 – Utility Management Program Committee Member, Moderator
- WEFTEC 2021 – Utility Management Program Committee Member
- WEFTEC 2022 – Utility Management Program Committee Member
- AIChE ICOSSE 2021 – Program Committee Member, Session Moderator
- AGU Fall Meeting 2023 – Session Chair

External Reviewer and Advisory Committees:

- Peer Reviewer - U.S. Department of Energy Geothermal Technologies Office Annual Merit Review 2022
- Technical Advisory Committee Member: Climate-informed projections of electricity generation availability, California Energy Commission. Project #EPC-21-037 (2022 – present)
- National Science Foundation Environmental Sustainability Program: Proposal Reviewer (2/2023)
- U.S. Department of Energy Established Program to Stimulate Competitive Research (EPSCoR) Proposal Reviewer (4/2024)

Peer-Reviewed Journal Service

- Associate Editor, *Earth's Future*, American Geophysical Union Journals (2022-present)
- Guest Editor, Special Issue in Physical and Natural Threats to Energy Infrastructure and Systems, *Environmental Research: Infrastructure and Sustainability*, IOP Publishing (12/2023-present)

Peer-Reviewed Journal Reviewer

- Elsevier Publishing Group: *Energy, Energy Policy, Fuel, Applied Energy, Energy & Buildings, Journal of Environmental Management, Journal of Energy Storage, Journal of Hydrology, Transportation Research Part D, Smart Energy, The Electricity Journal, Heliyon, Joule, Cell Reports Sustainability*
- Nature Publishing Group: *Nature, Nature Communications, Scientific Data, Scientific Reports, Nature Sustainability, Nature Communications Engineering*
- Springer Publishing Group: *Journal of Modern Power Systems and Clean Energy*
- American Institute of Chemical Engineers: *Environmental Progress & Sustainable Energy*
- Institute of Electrical and Electronics Engineers: *IET Renewable Power Generation, IEEE Transactions on Industrial Informatics, IET Generation, Transmission, and Distribution, IEEE Access*
- MDPI Publishing Group: *Hydrology, Energies*
- American Chemical Society: *Environmental Science & Technology*
- IOP Publishing Group: *Environmental Research Letters, Environmental Research: Infrastructure and Sustainability*
- Wiley Publishing Group: *Journal of Industrial Ecology, International Journal of Energy Research*
- Taylor & Francis Publishing Group: *Energy Sources Part A*
- American Meteorological Society: *Bulletin of the American Meteorological Society*
- Sage Publishing Group: *Transportation Research Record*