KATHRYN HINKELMAN

November 2024

Contact Information

Department of Civil and Environmental Engineering
University of Vermont
217 Votey Hall
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theseelab.org
Google Scholar Profile
ORCID: 0000-0002-8297-6036
Former Surname: Van Lieshout

Education

Pennsylvania State University — Jul 2023
Ph.D. in Architectural Engineering
Concentration in Mechanical | GPA: 4.0
Thesis: *Modelica modeling & ecosystem biomimicry of district energy systems*

University of California at Berkeley — May 2015
M.S. in Mechanical Engineering
Concentration in Design | GPA: 4.0
Thesis: *Environmental impact and indoor environmental quality assessment of Pinoleville Pomo Nation demonstration home: An implementation of life cycle assessment and culturally-inspired design*

University of Denver — Jun 2013
B.S. in Mechanical Engineering
Summa Cum Laude, Phi Beta Kappa, Departmental Distinction | GPA: 3.97
Thesis: *Intensity rankings of plyometric exercises using joint power absorption*

Appointments

University of Vermont
Assistant Professor, Dept. of Civil and Environmental Engineering — Aug 2024 – Present
Affiliate Faculty, Center for Resilient Energy & Autonomous Technologies in Engineering (CREATE) — Aug 2024 – Present
Director, Sustainable Energy and Environments (SEE) Laboratory — Feb 2024 – Present
Research Affiliate, Dept. of Civil and Environmental Engineering — Apr 2024 – Aug 2024

Pennsylvania State University
Postdoctoral Scholar, Sustainable Buildings and Societies Laboratory — Jul 2023 – Aug 2024
IBUILD Research Fellow, U.S. Dept. of Energy, Building Technologies Office — Jan 2022 – Jul 2023
Advisor: Dr. Wangda Zuo

University of Colorado Boulder
IBUILD Research Fellow, U.S. Dept. of Energy, Building Technologies Office — Aug 2021 – Dec 2021
Research Assistant, Sustainable Buildings and Societies Laboratory — May 2019 – Aug 2021
Teaching Assistant, Dept. of Civil, Environmental & Architectural Engineering — Aug 2018 – May 2019
Advisor: Dr. Wangda Zuo

Boulder Engineering Company
Mechanical & Electrical Engineer — Jul 2016 – Jul 2018
Mechanical Engineer — Jul 2015 – Jul 2016

University of California at Berkeley
Research Assistant, Berkeley Energy and Sustainable Technologies Laboratory — Jan 2014 – May 2015
Teaching Assistant, Dept. of Mechanical Engineering — Aug 2013 – Jan 2014
Advisor: Dr. Alice Agogino

Research Interests

Sustainable energy systems (cities, districts, buildings), thermo-fluid science, equation-based modeling (Modelica), numerical simulation, biomimicry/bio-inspired design, life cycle assessment, building controls

Peer-Reviewed Journal Publications

J-1. *(Under Review, Nov. 2024)* **Hinkelman, Kathryn**, Juan Diego Flores Garcia, Jing Wang, Saranya Anbarasu, Wangda Zuo. "A Review of Multi-Energy Systems from Resiliency and Equity Perspectives." *Renewable and Sustainable Energy Reviews*.

J-2. *(Under Revision, Oct. 2024)* Anbarasu, Saranya, **Kathryn Hinkelman**, Wangda Zuo, Bryan Birosak, Victor Mendez Ferreira. "Optimal Operation of Legacy Multi-Plant Steam District Heating Systems." *Energy Conservation and Management*.

J-3. Anbarasu, Saranya, **Kathryn Hinkelman**, Jing Wang, Wangda Zuo. 2024. "Exploring the Effects of Interdependencies on Energy Systems in Smart Communities: A Multi-Domain Modeling and Quasi-Monte Carlo Sensitivity Analysis." *Energy & Buildings, 319:6 114510.* 10.1016/j.enbuild.2024.11451.

J-4. **Hinkelman, Kathryn**, Saranya Anbarasu, Wangda Zuo. 2024. "Exergy-Based Ecological Network Analysis for Building and Community Energy Systems." *Energy & Buildings,* 303: 113807. 10.1016/j.enbuild.2023.113807.

J-5. **Hinkelman, Kathryn,** Yizhi Yang, Wangda Zuo. 2023. "Engineering Applications and Design Methodologies for Ecosystem Biomimicry: An Interdisciplinary Review Spanning Cyber, Physical, and Cyber-Physical Systems." *Bioinspiration & Biomimetics, 18:2 021001.* 10.1088/1748-3190/acb520.

J-6. Ildiri, Nasim, Heather Bazille, Yingli Lou, **Kathryn Hinkelman,** Whitney Gray, Wangda Zuo. 2022. "Impact of WELL Certification on Occupant Satisfaction and Perceived Health, Well-being, and Productivity: A Multi-Office Pre- Versus Post-Occupancy Evaluation." *Building and Environment,* 224: 109539. 10.1016/j.buildenv.2022.109539.

J-7. **Hinkelman, Kathryn**, Saranya Anbarasu, Michael Wetter, Antoine Gautier, Wangda Zuo. 2022. "A Fast and Accurate Modeling Approach for Water and Steam Thermodynamics with Practical Applications in District Heating System Simulation." *Energy,* 254:A 124227. 10.1016/j.energy.2022.124227.

J-8. **Hinkelman, Kathryn**, Jing Wang, Wangda Zuo, Antoine Gautier, Michael Wetter, Chengliang Fan, Nicholas Long. 2022. "Modelica-Based Modeling and Simulation of District Cooling Systems: A Case Study." *Applied Energy,* 311: 118654. 10.1016/j.apenergy.2022.118654.

J-9. Huang, Sen, Jing Wang, Yangyang Fu, Wangda Zuo, **Kathryn Hinkelman**, Raymond M. Kaiser, Dong He, Draguna Vrabie. 2021. "An open-source virtual testbed for a real Net-Zero Energy Community." *Sustainable Buildings and Society*, 75: 103255. 10.1016/j.scs.2021.103255.

J-10. Fan, Chengliang, **Kathryn Hinkelman**, Yangyang Fu, Wangda Zuo, Sen Huang, Chengnan Shi, Cary Faulkner, Xiaoqing Zhou. 2021. "Open-Source Modelica Models for the Control Performance Simulation of Chiller Plants with Water-side Economizer." *Applied Energy,* 299: 117337. 10.1016/j.apenergy.2021.117337.

J-11. Ye, Yunyang, **Kathryn Hinkelman**, Yingli Lou, Wangda Zuo, Gang Wang, Jian Zhang. 2021. "Evaluating the Energy Impact Potential of Energy Efficiency Measures for Retrofit Applications: A Case Study with U.S. Medium Office Buildings." *Building Simulation*, 14: 1377-1393. 10.1007/s12273-021-0765-z.

J-12. Ye, Yunyang, **Kathryn Hinkelman**, Jian Zhang, Wangda Zuo, and Gang Wang. 2019. "A Methodology to Create Prototypical Building Energy Models for Existing Buildings: A Case Study on U.S. Religious Worship Buildings." *Energy and Buildings,* 194: 351–365. 10.1016/j.enbuild.2019.04.037.

J-13. Lu, Xing, **Kathryn Hinkelman**, Yangyang Fu, Jing Wang, Wangda Zuo, Qianqian Zhang, and Walid Saad. 2019. "An Open Source Modeling Framework for Interdependent Energy-Transportation-Communication Infrastructure in Smart and Connected Communities." *IEEE Access,* 7: 55458–76. 10.1109/ACCESS.2019.2913630.

J-14. **Van Lieshout, Kathryn G**, Joy G Anderson, Kevin B Shelburne, and Bradley S Davidson. 2014. "Intensity Rankings of Plyometric Exercises Using Joint Power Absorption." *Clinical Biomechanics,* 29: 918–22. 10.1016/j.clinbiomech.2014.06.015.

Full-Paper Peer-Reviewed Conference Publications

C-1. Anbarasu, Saranya, Tanmay Ambadkar, Rosina Adhikari, **Kathryn Hinkelman**, Zhanwei He, Wangda Zuo, Ardeshir Moftakhar. 2024. "Optimizing Operational Costs in Combined Heat and Power Integrated District Heating Systems: A Reinforcement Learning Approach." *The 11th National Conference of IBPSA-USA (SimBuild)*, Denver, CO, USA. (link)

C-2. He, Zhanwei, Saranya Anbarasu, **Kathryn Hinkelman**, Jianjun Hu, Wangda Zuo, Ardeshir Moftakhar. 2024. "Computationally Efficient and Accurate Modeling of Combined Heat and Power Systems for District Energy Systems." *The 11th National Conference of IBPSA-USA (SimBuild)*, Denver, CO, USA. (link)

C-3. **Hinkelman, Kathryn**, David Milner, Wangda Zuo. 2023. "Open-Source Models for Sand-Based Thermal Energy Storage in Heating Applications." *The 15th International Modelica Conference*, Aachen, Germany. (link)

C-4. Milner, David, **Kathryn Hinkelman**, Jeffery Gifford, Wangda Zuo, Zhiwen Ma. 2023. "Sand-based Thermal Storage for Building Heating Applications: A District Energy Case Study." *The 7th International Energy Conference (ASTECHNOVA 2023)*. Yogyakarta, Indonesia.

C-5. **Hinkelman, Kathryn**, Saranya Anbarasu, Wangda Zuo. 2023. "Ecological Network Analysis of Integrated Energy Systems with Modelica: A Novel Biomimetic Approach for Building Design and Operation." *Building Simulation Conference*, Shanghai, China. (link)

C-6. **Hinkelman, Kathryn,** Wangda Zuo, Jing Wang, Sen Huang, Michael Wetter. 2022. "Ecosystem-Level Biomimicry for the Built Environment: Adopting Systems Ecology Principles for the Control of Heterogeneous Energy Systems." *The 5th International Conference on Building Energy and Environment.* Montreal, Canada. 10.1007/978-981-19-9822-5_284.

C-7. Anbarasu, Saranya, **Kathryn Hinkelman**, Wangda Zuo. 2022. "Tracing the Dependency of Water and Energy in Smart and Connected Communities through a Multi-Domain Modeling Framework." *The 5th International Conference on Building Energy and Environment.* Montreal, Canada. 10.1007/978-981-19-9822-5_19.

C-8. **Hinkelman, Kathryn**, Saranya Anbarasu, Michael Wetter, Antoine Gautier, Baptiste Ravache, Wangda Zuo. 2022. "Towards Open-Source Modelica Models for Steam-Based District Heating Systems." *The 1st International workshop on Open Source Modelling and Simulation of Energy Systems*, 1-6. Aachen, Germany. 10.1109/OSMSES54027.2022.9769121.

C-9. **Hinkelman, Kathryn**, Jing Wang, Chengliang Fan, Wangda Zuo, Antoine Gautier, Michael Wetter, Nicholas Long. 2021. "A Case Study on Condenser Water Supply Temperature Optimization with a District Cooling Plant." *The 14th International Modelica Conference*, 587-595. Linköping, Sweden. 10.3384/ecp21181587.

C-10. **Hinkelman, Kathryn**, Sen Huang, Jing Wang, Wangda Zuo. 2019. "Enhancing the Implementation of a First-order Equivalent Thermal Parameter Model to Enable Accurate and Robust Building Thermal Response Prediction." *Building Simulation Conference,* 1859-1865. Rome, Italy. 10.26868/25222708.2019.210582.

C-11. Ye, Yunyang, **Kathryn Hinkelman**, Jian Zhang, Yulong Xie, Wangda Zuo. 2019. "A Methodology to Determine Energy Savings Impact of Building Energy Code Upgrades: A Case Study on Small Offices." *Building Simulation Conference*, 3894-3901. Rome, Italy. 10.26868/25222708.2019.210692.

C-12. **Van Lieshout, Kathryn G**, Cindy Bayley, Sarah O Akinlabi, Lisa von Rabenau, and David Dornfeld. 2015. "Leveraging Life Cycle Assessment to Evaluate Environmental Impacts of Green Cleaning Products." In *Procedia CIRP*, 29:372–377. Sydney, Australia.

10.1016/j.procir.2015.02.063.

Peer-Reviewed Extended Abstracts

A-1. Ye, Yunyang, **Kathryn Hinkelman**, Wangda Zuo, Gang Wang. 2019. "ASHRAE TRP-1771: Methodology to Evaluate Sensitive Levels of Inputs for U.S. Commercial Building Models." *ASHRAE Summer Conference*, Kansas City, MO.

A-2. **Van Lieshout, Kathryn G**, Owen RW Dennis, Joy G Anderson, Kevin B Shelburne, Bradley S Davidson. 2013. "Intensity Rankings of Plyometric Exercises using Joint Power Absorption." *Medicine and Science in Sports and Exercise.*

Peer-Reviewed Poster Sessions

† BEST POSTER AWARD

P-1. **Hinkelman, Kathryn**. "BICEPS – Biomimetic Integrated Community Energy and Power Systems." *U.S. Department of Energy Building Technologies Office (BTO) Peer Review*, Arlington, VA, April 24-28, 2023.

† P-2. **Hinkelman, Kathryn**, Wangda Zuo. "Ecological Network Analysis for Architectural Engineering: How might building energy systems learn from nature?" *AEI Conference*, Denver, CO, April 12-14, 2023.

P-3. **Hinkelman, Kathryn**, Xing Lu, Wangda Zuo, Yangyang Fu, Jing Wang, Yingchen Zhang. "Multi-domain Modeling Framework for Future Smart and Connected Communities." *21st Century Energy Transition Symposium*, Denver, CO, April 1-2, 2019.

P-4. **Van Lieshout, Kathryn G**, Owen RW Dennis, Joy G Anderson, Kevin B Shelburne, Bradley S Davidson. "Intensity rankings of plyometric exercises using joint power absorption." *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28-June 1, 2013.

Non-Peer Reviewed Technical Reports

R-1. **Hinkelman, Kathryn**. 2023. "Modelica Modeling and Ecosystem Biomimicry of District Energy Systems." Doctoral Dissertation. *Pennsylvania State University*. etda.libraries.psu.edu/catalog/27446kgh5244.

R-2. **Van Lieshout, Kathryn G**. 2015. "Environmental impact and indoor environmental quality assessment of Pinoleville Pomo Nation demonstration home: An implementation of life cycle assessment and culturally-inspired design." Master's Thesis. *University of California, Berkeley*. 10.13140/RG.2.2.14890.90564.

R-3. Final Report (co-authored with Alice Agogino (PI) and student team). 2015. "Advanced UX Development Based on Innovative Technology: Integrating UX Design with the Internet of Things." Samsung Electronics Co., Ltd. DMC R&D Center.

R-4. Agogino, Alice (PI). **Kathryn Van Lieshout**, Chandrayee Basu, Kyunam Kim, Julien Caubel, Elizabeth Cheng, Aparna Dhinakaran. 2014. "Model Predictive Smart Lighting Commissioning System for Emerging Demand Management." Energy Innovations Small Grant Program: Final Report. California Energy Commission.

Presentation Sessions & Invited Talks

T-1. "Modeling of Smart, Sustainable, and Connected Communities." *Invited Research Seminar*, Department of Civil and Environmental Engineering, University of Vermont, October 18, 2024.

T-2. "Ecological Network Analysis of Integrated Energy Systems with Modelica: A Novel Biomimetic Approach for Building Design and Operation." *The 18th IBPSA International Conference and Exhibition (Building Simulation 2023)*, Shanghai, China, Virtual, September 5, 2023.

T-3. "Equation-Based Modeling and Ecosystem Biomimicry of Integrated Building Energy Systems." *Invited Research Seminar*, Department of Civil, Architectural and Environmental Engineering, Drexel University, May 26, 2023.

T-4. "BICEPS – Biomimetic Integrated Community Energy and Power Systems." *U.S. Department of Energy Building Technologies Office (BTO) Peer Review*, Arlington, VA, April 24-28, 2023.

T-5. "Advancements in Multidomain Modeling and System-Level Biomimicry for the Comprehensive Design of District Energy Systems." *Invited Research Seminar*, Department of Systems Engineering, Colorado State University, February 2, 2023.

T-6. "A Fast and Accurate Modeling Approach for Water and Steam Thermodynamics with Practical Applications in District Heating System Simulation." *The 2022 Building Performance Analysis Conference and SimBuild,* Seminar 5: Open Source Modeling for District Energy Systems, Chicago, IL, September 14, 2022.

T-7. "Ecosystem-Level Biomimicry for the Built Environment: Adopting Systems Ecology Principles for the Control of Heterogeneous Energy Systems." *The 5th International Conference on Building Energy and Environment,* Montreal, Canada, July 28, 2022.

T-8. "Virtual Testbed for Optimized Planning of Smart, Sustainable, and Connected Communities." *The 2022 IEEE Power & Energy Society General Meeting*, Denver, CO, July 19, 2022.

T-9. "From Furnaces to Forests: Innovations in Modeling and Simulation for the Transition of Legacy District Energy Systems to Integrated Biomimetic Designs." *Invited Research Seminar*, Dept. of Mechanical Engineering & Mechanics, Drexel University, Virtual, December 20, 2021.

T-10. "A Case Study on Condenser Water Supply Temperature Optimization with a District Cooling Plant." *The 14th International Modelica Conference*, Virtual, September 23, 2021.

T-11. "Modeling and Simulation of District Cooling Systems with Modelica." *IBPSA-USA Denver Chapter: Student Presentations*, Virtual, May 20, 2021.

T-12. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *The American Modelica Conference*, Virtual, September 22-24, 2020.

T-13. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *IBPSA-USA Denver Chapter: Student Presentations,* Golden, CO, November 21, 2019.

T-14. "Enhancing the Implementation of a First-order Equivalent Thermal Parameter Model to Enable Accurate and Robust Building Thermal Response Prediction." *Building Simulation Conference*. Rome, Italy, September 2-4, 2019.

T-15. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *Intelligent Building Operations Workshop*, Boulder, CO, August 7-9, 2019.

T-16. "Leveraging life cycle assessment to evaluate environmental impacts of green cleaning products." *22nd CIRP Conference on Life Cycle Engineering*, Sydney, Australia, April 7-9, 2015.

Research Funding

Monitoring Vermont Building and Energy Systems for Ecological and Human Health Impacts
Sponsor: Office of the Vice President for Research, University of Vermont, EXPRESS Grant Program
Total Award: $3,000
My Portion: $3,000
My Role: Sole PI
Period: 12/24-12/25

Biomimetic Integrated Community Energy and Power System (BICEPS)
Sponsor: U.S. Department of Energy, Building Technologies Office, IBUILD Fellowship
Total Award: $164,000
My Portion: $164,000
My Role: Individual fellowship recipient
Effort Devoted: 100%
Period: 08/21-07/23

EAGER: Collaborative Research: Modernizing Cities via Smart Garden Alleys with Application in Makassar City, CNS-2025459
Sponsor: National Science Foundation, Computer and Network Systems
Total Award: $175,000
My Portion: $0
PI: Wangda Zuo
My Role: Contributed to full proposal writing and concept development at the equivalent level of a Co-PI
Period: 07/20-06/22

Optimal Co-Design of Integrated Thermal-Electrical Networks and Control Systems for Grid-interactive Efficient District (GED) Energy Systems, DE-EE0009139
Sponsor: U.S. Department of Energy (DOE), Advanced Manufacturing Office
Total Award: $4,159,922
My Portion: $0
PI: Wangda Zuo
My Role: Contributed to full proposal writing and concept development at the equivalent level of a Co-PI
Period: 06/20-12/23

Research Advising

Master's Students
Chris Leppla, M.S. Complex Systems and Data Science — Oct. 2024 – Present

Undergraduate Students
Maggie Jaynes, B.S. Civil and Environmental Engineering — Sep. 2024 – Present
Emmet Kimberly, B.S. Civil and Environmental Engineering — Sep. 2024 – Present
Elliott Austin, B.S. Civil and Environmental Engineering — Sep. 2024 – Present

Teaching

Guest Lecturer
AE 597: Advanced Modeling & Simulation for Building & Community Energy Systems, Pennsylvania State University — Fall '22, '23, '24
AREN 4317: Architectural Engineering Design, University of Colorado Boulder — Fall 2019

Grader, University of Colorado Boulder
AREN 4890: Sustainable Building Design — Fall '19, '20, '21
Teaching Assistant, University of Colorado Boulder
AREN 4317: Architectural Engineering Design — Spring 2019
AREN 3540: Illumination I — Fall 2018

Graduate Student Instructor, University of California, Berkeley
ME 110: Introduction to New Product Development — Spring 2014
ME 107: Mechanical Engineering Laboratory — Fall 2013

Academic Tutor, Athletics and Recreation, University of Denver — Jan 2011 – Jun 2012
- Tutored students in Differential Equations, Calculus, and Engineering Concepts
- Taught class material that was missed due to athletic travel

Honors and Awards

Postdoctoral Scholar Award, Pennsylvania State University — 2024
SimBuild 2024 Best Reviewer Award — 2024
IBUILD Graduate Research Fellowship, **$164,000** total, 2 years — 2021-2023
U.S. Department of Energy, Energy Efficiency and Renewable Energy, Building Technologies Office, Managed by Oak Ridge National Laboratory
Borda Graduate Scholarship in Honor of Gifford H. Albright, PSU — 2022
Gordon D. Kissinger Graduate Research Fellowship, PSU — 2022
Harvey and Geraldine Brush Graduate Fellowship in Engineering, PSU — 2022
Marlene and Joseph Borda Architectural Engineering Graduate Fellowship, PSU — 2022
P.E.O. Scholar Award, **$20,000** international merit-based award — 2021

	International Building Performance Simulation Association (IBPSA) Project 1 Scholarship	2019
	The Link Foundation Energy Fellowship Program Honorable Mention	2019
	Colorado Engineering Council Silver Medal & Certificate of Merit	2013
	Pioneer Award *"The **highest honor** given to undergraduate students" at the University of Denver (DU)*	2013
	Mechanical Engineering Departmental Distinction, DU	2013
	Taylor Achievement Award, Ortho Transmission, LLC	2013
	Hornbeck Scholar (7 quarters), DU	2010-2013
	Dean's List (8 quarters), DU	2010-2013
	A University of Denver Scholar-Athlete of the Year (4 years)	2009-2013
	NSCAA Scholar All-West Region Team	2012
	Second Team All-WAC Selection	2012
	Academic All-American First Team, Division I Women's Soccer	2011
	Preseason All-Sun Belt Conference Team	2011
	Sun Belt Conference Commissioner's List (all 3 seasons)	2009-2011
	SBC All-Conference First Team	2019
	DU Invitational All-Tournament Team	2009
	CS360's Primetime Performers of the Week (9/15)	2009

Professional Associations	ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers	2017 – Present
	IBPSA: International Building Performance Simulation Association	2019 – Present
	ASEE: American Society of Engineering Education	2022 – Present
	ASCE: American Society of Civil Engineers	2023 – Present

Service & Leadership

Hiring & Search Committee, Sustainable Buildings and Societies Lab
Chair, Pennsylvania State University — Jul 2023 – Jul 2024
Chair, University of Colorado Boulder — Feb 2019 – Apr 2020
- Reviewed applicants, led interviews, collected feedback, and provided recommendations.

Conference Chair — Aug 2019
Intelligent Building Operations Workshop, University of Colorado Boulder
- Session chair for Modeling and Assessment Tools

Publication Reviewer
Journals
- Building Simulation, An International Journal
- Electric Power Systems Research
- Energies
- IEEE Access
- IEEE Transactions on Smart Grid
- Journal of Architectural Engineering
- Journal of Building Performance Simulation
- Resources, Conservation and Recycling

Conference Proceedings
- ASHRAE Winter Conference
- ASME International Manufacturing Science and Engineering Conference
- Building Simulation
- IBPSA-USA SimBuild
- International Conference on Building Energy and Environment (COBEE)

Collegiate Athlete — Aug 2009 – Nov 2012
Division I Women's Soccer Team, University of Denver

- Balanced intensive athletic duties of regular practice, games, and travel with a difficult course load.
- Regular starter and leader to the team, finishing 22nd in the nation with a Sweet Sixteen NCAA appearance in senior season.