Heather P. H. Liddell

Curriculum Vitae - updated December 2024

Assistant Professor, School of Mechanical Engineering
and Department of Environmental & Ecological Engineering
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EDUCATION

Doctor of Philosophy in Materials Science — *University of Rochester, 2014*
Master of Science in Mechanical Engineering — *University of Rochester, 2010*
Bachelor of Science in Mechanical Engineering — *University of Rochester, 2008*

PROFESSIONAL EXPERIENCE

2023 – present **Purdue University**, West Lafayette, IN
Assistant Professor of Mechanical Engineering and Environmental & Ecological Engineering (joint appt.)
Faculty Affiliate, Purdue University Institute for a Sustainable Future

2020 – 2023; 2014 – 2017 **Energetics**, Washington, DC
Program Manager for Analysis & Modeling (Contracted to the U.S. Dept. of Energy)
Prior Roles: Senior Scientist; Staff Scientist; *Associate Scientist*

2017 – 2020 **U.S. Naval Research Laboratory**, Washington, DC
American Society for Engineering Education (ASEE) NRL Postdoctoral Research Fellow

2013 – 2014 **U.S. Dept. of Transportation – National Highway Traffic Safety Administration**, Washington, DC
Safety Standards Engineer – Vehicle Dynamics Division – Rulemaking

2010 – 2013 **University of Rochester Laboratory for Laser Energetics**, Rochester, NY
Frank J. Horton Graduate Research Fellow

2008 – 2010 **University of Rochester Mechanical Engineering Department**, Rochester, NY
Graduate Research Assistant and Graduate Teaching Assistant

SELECTED AWARDS & RECOGNITIONS

2024 U.S. Dept. of Energy EnergyTech University Prize 2024 Faculty Explorer Award
2023 Keynote Speaker, 2023 Sustainable Metals Manufacturing Workshop, Pacific Northwest National Laboratory
2022 Energetics Shooting Star Award (peer-nominated), for innovation
2022 Energetics Above and Beyond Awards (2015, 2016, 2021, 2022), for outstanding job performance
2017 American Society for Engineering Education Postdoctoral Fellowship at the U.S. Naval Research Laboratory
2016 U.S. Dept. of Energy Secretary's Appreciation Award, for technical contributions to the 2015 QTR
2014 U.S. Dept. of Transportation Secretary's Honor Award, for community engagement with at-risk youth
2010 Frank J. Horton Graduate Research Fellowship, University of Rochester Laboratory for Laser Energetics
2009 Pandeli Durbetaki Graduate Fellowship, University of Rochester
2009 Dean's Graduate Fellowship, University of Rochester
2008 B.S. degree granted with *Highest Distinction in Mechanical Engineering* (highest departmental honors)
2008 University of Rochester Helmut Weymann Prize, for ingenuity and skill in engineering experimentation
2007 Elected to Tau Beta Pi
2004 University of Rochester Rush Rhees Scholarship

GRANTS

2025 co-PI **Integrated Passive and Active Underwater Wave Control for Comprehensive Noise Abatement in Offshore Wind Installation**
DOE Wind Energy Technologies Office ($5,128,956; Liddell share 25% or $1,282,239)

2024 PI **Teaching the Valley of Death: Learning Resources for Techno-Economics of Emerging Technologies**
DOE Office of Technology Transitions ($4,000)

2024 PI **Input-Output Analysis of Mass Flows in Manufacturing Production Networks**

DOE Industrial Efficiency & Decarbonization Office, as sub to National Renewable Energy Lab. ($93,046)

2024 co-PI **Optimized Radio Frequency (RF) Processing for Safer & More Sustainable Drying of Dairy Forage**
Purdue Ag-Eng Initiative seed grant ($50,000; Liddell share 50% or $25,000)

FUNDING AGENCY REVIEW PANEL ACTIVITY

2024 DOE Advanced Research Projects Agency – Energy (ARPA-E): Vision OPEN 2024 FOA
2024 DOE Office of Technology Transitions: FY24 Core Laboratory Infrastructure for Market Readiness Lab Call
2024 DOE Advanced Materials & Manufacturing Technology Office: "Re-X Before Recycling" Prize
2023 DOE Vehicle Technologies Office: Merit Reviewer for 2023 Annual Merit Review
2022 DOE Vehicle Technologies Office: Merit Reviewer for 2022 Annual Merit Review
2021 DOE Vehicle Technologies Office: Merit Reviewer for 2021 Annual Merit Review
2020 DOE Vehicle Technologies Office: Merit Reviewer for 2020 Annual Merit Review

TECHNICAL COMMITTEES & SERVICE APPOINTMENTS

2024-present Executive Committee of The Adhesion Society – Sustainability Chair
2024-present Purdue Environmental & Ecological Engineering Safety Committee
2023-present American Center for Life Cycle Assessment (ACLCA) Education Committee
2023-present ACLCA Conference Planning Committee (2023, 2024, 2025)
2023-present Purdue Green Leaps (Environmental LCA) Student Club – Faculty Advisor
2023-present Purdue Environmental & Ecological Engineering Graduate Committee
2022-present ACLCA Technical Working Group on LCA for Emerging Technologies
2021-present Planetary Limits Academic Network (PLAN)
2022-2023 IEA Technical Collaboration Program on Advanced Materials for Transportation (AMT)
2022-2023 USDRIVE Government-Industry Partnership: Materials Technical Team (MTT)

STUDENT ADVISING & MENTORSHIP

Graduate Students Supervised at Purdue (as Advisor or Co-Advisor)

2025 (Expected)	Elizabeth Kelley	M.S., Environmental & Ecological Engineering
2025 (Expected)	Catherinne Mejia Melara	M.S., Environmental & Ecological Engineering
2025 (Expected)	Sanatkumar Rajagopalan	M.S., Mechanical Engineering
2026 (Expected)	Andrew Morrissey	M.S., Mechanical Engineering (Combined Degree BS/MS)
2028 (Expected)	Tripta Bhattacharjee	Ph.D., Environmental & Ecological Engineering
2028 (Expected)	Heyichen Xu	Ph.D., Environmental & Ecological Engineering
2029 (Expected)	Zubair Mumin Wahed	Ph.D., Mechanical Engineering

Graduate Students Mentored at Purdue (as Thesis Advisory Committee Member)

2025 (Expected)	Venkat Roy	Ph.D., Environmental & Ecological Engineering
2026 (Expected)	Xiaohan Wu	Ph.D., Environmental & Ecological Engineering
2027 (Expected)	Albin John	Ph.D., Environmental & Ecological Engineering
2028 (Expected)	Aishwary Shrivastava	Ph.D., Mechanical Engineering

Undergraduate Student Researchers Supervised at Purdue

2024	Donghyun "Han" Lee	B.S., Mechanical Engineering
2024	John Dec	B.S., Mechanical Engineering
2025 (Expected)	Joel Kerr	B.S., Mechanical Engineering
2025 (Expected)	Andrew Morrissey	B.S., Mechanical Engineering (Combined Degree BS/MS)
2027 (Expected)	Yuvraj Jhanwar	B.S., Mechanical Engineering
2027 (Expected)	Olivia Helmuth	B.S., Environmental & Ecological Engineering

Undergraduate Student Researchers Supervised (from other universities)

2024	Kayla Huang	B.S., Materials Science & Engineering, UIUC

STUDENT AWARDS

2024	Catherinne Mejia Melara	2024 ACLCA Conference Student Poster Competition, 1st Place
2024	Elizabeth Kelley	2024 ACLCA Conference Student Poster Competition, 2nd Place
2024	Andrew Morrissey	2024 Purdue Bottomley Undergraduate Research Scholarship

TEACHING

Regular credit-bearing courses at Purdue:

Fall 2023	ME 46300 Engineering Design	Enrollment: 28	Mean Instructor Rating: 4.63 / 5.00
Spring 2024	EEE 56000 Industrial Carbon Accounting	Enrollment: 33	Mean Instructor Rating: 4.69 / 5.00
Fall 2024	ME 46300 Engineering Design	Enrollment: 21	Mean Instructor Rating: 4.62 / 5.00
Spring 2025	EEE 59500 Carbon Acct. & Sustainability	Enrollment: TBD	Mean Instructor Rating: TBD

Short courses at Purdue and elsewhere:

Summer 2024	ME 297 Designing a Product with a 3D Printer	Purdue Summer College for High School Students
Fall 2024	Introduction to Carbon Accounting	Short course at the *2024 LCA Institute* (ACLCA)

PUBLICATIONS AND PRESENTATIONS

Work dated before June 2013 was published under maiden name, Heather P. Howard.

► Mechanics and/or Materials Focus ► Energy & Sustainability Focus ► Other Focus

Peer-Reviewed Journal Articles

1. ► R. Woods-Robinson, M. A. Carbajales-Dale, A. Cheng, G. Cooney, A. Kirchofer, **H. P. H. Liddell,** S. Moni, L. Petersen, I. D. Posen, S. Sleep, E. Wachs, S. Zargar, and J. A. Bergersen, "Controversy and consensus: common ground and best practices for life cycle assessment of emerging technologies," submitted to the Journal of Industrial Ecology (2024).
2. ► H. Chen, **H. P. H. Liddell,** A. A. Ogale, Z. C. Miao, M. W. Ijeoma, and M. Carbajales-Dale, "Uncovering Variations and Data Gaps in the Energy Demand and Environmental Impact from Carbon Fiber Manufacturing," submitted to Resources, Conservation, and Recycling (2024).
3. ► **H. P. H. Liddell**, B. M. Ray, and J. W. Cresko, "A retrospective time-series analysis of circular economy and industrial decarbonization metrics in the United States, 1998-2022," submitted to the Journal of Advanced Manufacturing and Processing (2024).
4. ► **H. P. H. Liddell**, L. M. Erickson, J. P. Tagert, A. Arcari, G. M. Smith, and J. Martin, "Mode mixity and fracture in pull-off adhesion tests," Engineering Fracture Mechanics 281, 109120 (2023).
5. ► **H. P. H. Liddell** and M. H. Merrill, "In situ visualization of particle motions during wipe sampling of explosives and other trace particulate materials," ACS Applied Materials & Interfaces 11, 23780-23788 (2019).
6. ► L. E. DeGreeff, **H. P. H. Liddell**, W. R. Pogue III, M. H. Merrill, and K. J. Johnson, "Effect of re-use of surface sampling traps on surface structure and collection efficiency for trace explosive residues," Forensic Science International 297, 254-264 (2019).
7. ► **H. P. H. Liddell**, J. C. Lambropoulos, and S. D. Jacobs, "Thermomechanical model to assess stresses developed during elevated-temperature cleaning of coated optics," Applied Optics 53, 5865-5878 (2014).
8. ► **H. P. H. Liddell**, K. Mehrotra, J. C. Lambropoulos, and S. D. Jacobs, "Fracture mechanics of delamination defects in multilayer dielectric coatings," Applied Optics 52, 7689–7698 (2013).
9. ► **H. P. Howard**, A. F. Aiello, J. G. Dressler, N. R. Edwards, T. J. Kessler, A. A. Kozlov, I. R. T. Manwaring, K. L. Marshall, J. B. Oliver, S. Papernov, A. L. Rigatti, A. N. Roux, A. W. Schmid, N. P. Slaney, C. C. Smith, B. N. Taylor, and S. D. Jacobs, "Improving the performance of high-laser-damage-threshold, multilayer dielectric pulse-compression gratings through low-temperature chemical cleaning," Applied Optics 52, 1682–1692 (2013). [as H. P. Howard]
10. ► K. Mehrotra, **H. P. Howard**, S. D. Jacobs, and J. C. Lambropoulos, "Nanoindentation of high-aspect-ratio pillar structures on optical multilayer dielectric diffraction gratings," AIP Advances 1, 042179 (2011). [as H. P. Howard]
11. ► **H. P. Howard**, J. Cheng, P. T. Vianco, and J. C. M. Li, "Interface flow mechanism for tin whisker growth," Acta Materialia 59, 1957–1953 (2011). [as H. P. Howard]

Articles in Technical & Trade Magazines

12. ► **H. P. H. Liddell**, A. C. Carpenter, and J. W. Cresko, "Life Cycle Thinking for Sustainability-Informed Decisionmaking," Chemical Engineering Progress, June 2022. Invited by editor.
13. ► S. Sikirica, S. Whalen, P. Kurup, H. Schwartz, and **H. Liddell**, "Low-Energy, High-Throughput Extrusion of High-Strength Aluminum Alloy 7075," Industrial Heating Magazine, April 2021. Invited by editor.

14. ▶ S. Sikirica, B. Cottom, and **H. Liddell**, "Challenges and Solutions for Yttrium Aluminum Garnet as a Next-Generation Thermal Barrier Coating," Industrial Heating Magazine, March 2021. Invited by editor.

U.S. Government Reports

15. ▶ **H. P. H. Liddell**, I. Atakpa, S. Gage, K. Huang, S. Morgan, D. Sellers, S. Brueske, A. Carpenter, J. Cresko, "Sustainable Materials Selection in Manufactured Products: A Framework for Design-Integrated Life Cycle Thinking with Case Studies," DOE Technical Report No. DOE/EE-2766 (U.S. Department of Energy, 2023).

16. ▶ J. Cresko, E. Rightor, A. Carpenter, K. Peretti, N. Elliott, S. Nimbalkar, W. R. Morrow III, A. Hasanbeigi, B. Hedman, S. Supekar, C. McMillan, … , **H. Liddell**, et al., U.S. Department of Energy's *Industrial Decarbonization Roadmap*, DOE Technical Report No. DOE/EE-2635 (U.S. Department of Energy, 2022).

17. ▶ **H. P. H. Liddell**, C. Dollinger, A. Fisher, S. Brueske, A. C. Carpenter, and J. W. Cresko, "Bandwidth Study on Energy Use and Potential Energy Saving Opportunities in U.S. Carbon Fiber Reinforced Polymer Manufacturing," DOE Technical Report No. DOE/EE-1662 (U.S. Department of Energy, 2017).

18. ▶ **H. P. H. Liddell**, C. Dollinger, A. Fisher, S. Brueske, A. C. Carpenter, and J. W. Cresko, "Bandwidth Study on Energy Use and Potential Energy Saving Opportunities in U.S. Glass Fiber Reinforced Polymer Manufacturing," DOE Technical Report No. DOE/EE-1666 (U.S. Department of Energy, 2017).

19. ▶ M. Justiniano, B. Levie, K. Jamison, **H. Liddell**, B. Chadwell, S. Brueske, A. Carpenter, and J. W. Cresko, "Bandwidth Study on Energy Use and Potential Energy Saving Opportunities in U.S. Glass Manufacturing," DOE Technical Report No. DOE/EE-1572 (U.S. Department of Energy, 2017).

20. ▶ D. Glassbrenner, A. Morgan, R. Kreeb, A. Svenson, **H. Liddell**, and F. Barickman, "A target population for automatic emergency braking in heavy vehicles," NHTSA Technical Report No. DOT-HS-812-390 (U.S. Department of Transportation, 2017).

21. ▶ J. W. Cresko, D. K. Shenoy, **H. P. H. Liddell**, and R. N. Sabouni, "Innovating Clean Energy Technologies in Advanced Manufacturing," chapter in *The Quadrennial Technology Review 2015* (U.S. Department of Energy, 2015), pp. 182–225.

22. ▶ **H. P. H. Liddell**, "Materials for Harsh Service Conditions," Technology Assessment for *The Quadrennial Technology Review 2015* (U.S. Department of Energy, 2015), Report Appendix 6H.

23. ▶ **H. P. H. Liddell**, K. Mehrotra, J. C. Lambropoulos, and S. D. Jacobs, "Fracture mechanics of delamination defects in multilayer dielectric coatings," *LLE Review Quarterly Report* 135, 187–199, Laboratory for Laser Energetics, Rochester, NY, LLE Document No. DOE/NA/28302-1131 (2013).

24. ▶ **H. P. Howard**, A. F. Aiello, J. G. Dressler, N. R. Edwards, T. J. Kessler, A. A. Kozlov, I. R. T. Manwaring, K. L. Marshall, J. B. Oliver, A. L. Rigatti, A. N. Roux, A. W. Schmid, N. P. Slaney, C. C. Smith, B. N. Taylor, and S. D. Jacobs, "Laser damage threshold enhancement in multilayer dielectric diffraction gratings through targeted chemical cleaning," *LLE Review Quarterly Report* 131, 149–158, Laboratory for Laser Energetics, Rochester, NY, LLE Document No. DOE/NA/28302-1064 (2012). [as H. P. Howard]

Invited Talks & Seminars

25. ▶ **H. P. H. Liddell**, E. Kelley, and L. Wachs, "Data development for a physically extended EEIO model to support industrial decarbonization," invited speaker for the DOE Industrial Efficiency & Decarbonization Office Strategic Analysis research seminar series, virtual, November 7, 2024.

26. ▶ **H. P. H. Liddell**, "Industrial Decarbonization Pathways for the United States," invited speaker at the 2024 Global Product Systems Sustainability (GPSS) Workshop, University of Rhode Island, Kingston, RI, October 2-5, 2024.

27. ▶ D. R. Cooper, **H. P. H. Liddell**, R. Geyer, and D. C. A. Pigosso, "Industrial Decarbonization and Demand," invited session co-chair at the 2024 Global Product Systems Sustainability (GPSS) Workshop, University of Rhode Island, Kingston, RI, October 2-5, 2024.

28. ▶ **H. P. H. Liddell,** P. Rao, and J. Cresko, "Challenge Session: Global Harmonization of LCA," invited co-organizer and facilitator of plenary Challenge Session at the 2024 American Center for Life Cycle Assessment (ACLCA) Conference, Snowbird, UT, September 24-26, 2024.

29. ▶ **H. P. H. Liddell,** "Introduction to Carbon Accounting," invited instructor for the *LCA Institute* at the 2024 American Center for Life Cycle Assessment (ACLCA) Conference, Snowbird, UT, September 24-26, 2024.

30. ► J. F. Hajjar, J. Jung, **H. P. H. Liddell,** S. Ukkusuri, M. Velay-Lizancos, and A. Varma, "Panel Discussion: Designing for Climate Change & Sustainability," invited panelist for the *Purdue Engineering Distinguished Lecture Series*, post-lecture panel discussion featuring Prof. Jerome F. Hajjar. West Lafayette, IN, September 12, 2024.

31. ►► G. Wan, N. Deneke, **H. P. H. Liddell**, M. Seitz, J. Wilker, and L. Lopez, "Panel Discussion: Sustainability and Adhesion," invited panelist at the 47th Annual Meeting of the Adhesion Society, Savannah, GA, February 11-14, 2024.

32. ►► **H. P. H. Liddell**, "Materials Development & Lightweighting for Electric Vehicle Decarbonization: An Environmental Life Cycle Perspective with an Outlook to 2050," invited speaker for a Mechanical Engineering Research Seminar, IUPUI, Indianapolis, IN, November 9, 2023.

33. ► **H. P. H. Liddell**, "Should We Lightweight Electric Vehicles? An Environmental Life Cycle Perspective with an Outlook to 2050," invited speaker for an Environmental & Ecological Engineering Research Seminar, Purdue University, West Lafayette, IN, October 3, 2023.

34. ► **H. P. H. Liddell**, "Lightweighting in Electric Vehicles: A Prospective Life Cycle Opportunity Analysis," invited presentation to the Environmental & Ecological Engineering External Advisory Committee, Purdue University, West Lafayette, IN, September 22, 2023.

35. ► J. Cresko, **H. P. H. Liddell**, A. Carpenter, C. Dollinger, T. Wenning, P. Stephens, D. Cooper, and A. Peterman, "Strategies for Decarbonizing Industry: An Interactive Discussion & Debate," invited co-organizer of conference-wide Action Session at the ACEEE Industry Summer Study, Detroit, MI, July 10-13, 2023.

36. ► **H. P. H. Liddell**, "Sustainable Materials for Transportation Sector Decarbonization: A Life Cycle Perspective with an Outlook to 2050," invited Keynote Address for the Sustainable Metals Manufacturing Workshop, Pacific Northwest National Laboratory, Richland, WA, March 29-30, 2023.

37. ► **H. P. H. Liddell**, S. Gage, A. Carpenter, and J. Cresko, "A Design-Integrated Framework for Evaluating the Sustainability Impacts of Materials Substitutions and Recycling Decisions," invited speaker at the 10th International Congress on Sustainability Science & Engineering, virtual, September 13-15, 2021.

38. ► **H. Liddell**, C. Rusnak, N. Fleet, and S. Barber, 2018 Naval Research Laboratory Women in Science and Engineering (NRL WISE) Career Panel of Women Scientists, invited panelist, U.S. Naval Research Laboratory, Washington D.C., July 17, 2018.

39. ► **H. P. H. Liddell**, "Failure analysis and fracture mechanics model for delamination defects in multilayer optical coatings," invited speaker for a Multifunctional Materials Branch Seminar, U.S. Naval Research Laboratory, Washington D.C., October 11, 2016.

40. ► J. C. Lambropoulos, K. Mehrotra, **H. P. Howard**, and S. D. Jacobs, "Glass ductility and fracture at the 50- to 100-nm scale," co-author of an invited presentation at the OSA Imaging and Applied Optics Congress: Optical Fabrication and Testing, Monterey CA, June 24–27, 2012. [as H. P. Howard] ★

41. ► **H. P. Howard**, "Evaluating thermal stresses in large coated optics: substrate thickness effects," invited speaker for a Mechanical Engineering Dept. Seminar, University of Rochester, Rochester NY, April 20, 2012. [as H. P. Howard]

42. ► **H. P. Howard**, "An improved cleaning method to enhance the damage threshold of MLD gratings," invited speaker at the International Committee on Ultra-high Intensity Lasers (ICUIL) Conference, Mamaia, Romania, September 16–21, 2012. [as H. P. Howard]

Contributed Conference Presentations & Proceedings Papers

★ Starred contributions indicate that an accompanying proceedings paper was (or will be) published. Unstarred contributions were presentation-only.

43. ► **H. P. H. Liddell**, B. Kelley, L. Wachs, A. Carpenter, and J. Cresko, "A physically extended EEIO framework for decarbonization and circularity assessment in United States manufacturing supply chains," submitted to the REMADE Circular Economy Tech Summit & Conference, Washington, DC, April 10-11, 2025. ★

44. ► T. Bhattacharjee, J. Mulrow, and **H. P. H. Liddell**, "Re-Investment Rebound Dynamic in the Cement Industry," submitted for the 32nd CIRP Conference on Life Cycle Engineering (LCE 2025), Manchester, UK, April 7-9, 2025. ★

45. ► E. G. Kelley, E. Wachs, and **H. P. H. Liddell**, "Data development for a physically extended EEIO model to assess the life cycle emissions intensity of U.S. manufactured goods on a mass basis," presented at the 2024 American

Center for Life Cycle Assessment (ACLCA) Conference, Snowbird, UT, September 24-26, 2024. Poster. *(Honors: second place in student poster competition).*

46. ► C. A. Mejia Melara, D. L. W. Smith, and **H. P. H. Liddell**, "Life-Cycle Impact Comparison of Two Industrial Drying Methods for Alfalfa Dairy Forage: Radiofrequency and Convective Drying," presented at the 2024 American Center for Life Cycle Assessment (ACLCA) Conference, Snowbird, UT, September 24-26, 2024. Poster. *(Honors: first place in student poster competition).*

47. ► H. Chen, **H. P. H. Liddell**, and M. Carbajales-Dale, "Sustainability in Carbon Fiber Manufacturing: Insights from Life Cycle Assessment," presented at the 2024 American Center for Life Cycle Assessment (ACLCA) Conference, Snowbird, UT, September 24-26, 2024.

48. ► S. Ogunmodede, C. Laux, C. Elizabeth, S. Futerer, and **H. P. H. Liddell**, "Integrating Lean and Sustainability into a Curricular Framework," presented at the 7th International Conference on Operational Excellence (OPEX) in Higher Education, Galway, Ireland, September 2-3, 2024. Poster.

49. ► J. Bergersen, M. Carbajales-Dale, G. Cooney, J. Cresko, A. Kirchofer, M. Kumar, **H. P. H. Liddell**, S. Moni, L. Peterson, Posen, D. I., Sleep, S., E. Wachs, R. Woods-Robinson, "LCA of emerging technologies: we can't agree, so let's stop trying," Special Session at the International Symposium on Sustainable Systems and Technology (ISSST), Baltimore, MD, June 18-20, 2024.

50. ► **H. P. H. Liddell**, B. Ray, and J. W. Cresko, "A retrospective time-series analysis of circular economy and industrial decarbonization metrics in the United States, 1998-2022," presented at the REMADE Circular Economy Tech Summit & Conference, Washington, DC, April 10-11, 2024. ★

51. ► **H. P. H. Liddell**, "Should we lightweight electric vehicles? A life cycle perspective with an outlook to 2050," presented at TMS 2024, Energy Technologies and CO_2 Management Symposium, Orlando, FL, March 3-7, 2024.

52. ► **H. P. H. Liddell**, "Crack path measurement for disambiguation of failure modes in pull-off adhesion tests," presented at the 47th Annual Meeting of the Adhesion Society, Savannah, GA, February 11-14, 2024.

53. ► D. A. Dillard, G. Dillingham, **H. P. H. Liddell**, "Adhesive bondline thickness effects: reflecting on what we think we understand," presented at the 47th Annual Meeting of the Adhesion Society, Savannah, GA, February 11-14, 2024.

54. ► J. Cresko, A. Carpenter, P. Rao, S. Supekar, T. Uekert, D. Kamath, **H. P. H. Liddell**, P. Nagapurkar, and H. Fuchs, "Beyond industrial decarbonization: Pathways and challenges to sustainable manufacturing," Special Session at the American Society for Life Cycle Assessment (ACLCA) 2023 Conference, Burlington, VT, September 26-28, 2023.

55. ► K. Morrissey, S. Gause, C. Dollinger, **H. P. H. Liddell**, and J. Cresko, "Environmentally Extended Input-Output for Industrial Decarbonization Analysis (EEIO-IDA): A hands-on demo of a new Excel-based scenario modeling tool," Special Session at the American Society for Life Cycle Assessment (ACLCA) 2023 Conference, Burlington, VT, September 26-28, 2023.

56. ► K. Peretti, K. Morrissey, **H. P. H. Liddell**, M. Keane, A. Carpenter, M. Seitz, and J. Cresko, "LCA as a complementary tool for circular economy approaches: Applications and challenges," Special Session at the American Society for Life Cycle Assessment (ACLCA) 2023 Conference, Burlington, VT, September 26-28, 2023.

57. ► J. Steen, D. Thaller, **H. P. H. Liddell**, and J. Cresko, "A new DOE impact assessment tool: Techno-economic, Energy, and Carbon Heuristic Tool for Early-Stage Technologies (TECHTEST)," presented at the American Society for Life Cycle Assessment (ACLCA) 2023 Conference, Burlington, VT, September 26-28, 2023.

58. ► S. Gause, **H. P. H. Liddell**, C. Dollinger, J. Steen, and J. Cresko, "Hotspot detection for industrial decarbonization opportunities using environmentally extended input-output (EEIO) modeling," presented at the ACEEE Industry Summer Study, Detroit, MI, July 10-13, 2023.

59. ► **H. P. H. Liddell**, S. Gause, C. Dollinger, J. Steen, and J. Cresko, "Environmentally extended input-output (EEIO) modeling for industrial decarbonization opportunity analysis: a circular economy case study," presented at the REMADE Circular Economy Tech Summit & Conference, Washington, DC, March 20-21, 2023. ★

60. ► **H. P. H. Liddell**, J. Gibbs, and S. Ollila, "A fleet-based statistical assessment of the prospective opportunity for electric vehicle lightweighting to reduce greenhouse gas emissions in the United States," presented at the American Society for Life Cycle Assessment (ACLCA) 2022 Conference, virtual, November 7-12, 2022.

61. ► S. Gause, **H. P. H. Liddell**, C. Dollinger, E. Yüzügüllü, J. Steen, and J. Cresko, "Application of environmentally extended input/output (EEIO) techniques for industrial decarbonization opportunity analysis," presented at the American Society for Life Cycle Assessment (ACLCA) 2022 Conference, virtual, November 7-12, 2022.

62. ► S. Supekar, C. McMillan, **H. P. H. Liddell**, A. Carpenter, and S. Nimbalkar, "Developing shared foundational datasets for industrial modeling," presented as a Special Session at the American Society for Life Cycle Assessment (ACLCA) 2022 Conference, virtual, November 7-12, 2022.

63. ► J. Bergerson, D. Posen, M. Carbajales-Dale, S. Moni, A. Kirchofer, **H. P. H. Liddell**, et al., "Life Cycle Assessment of Emerging Technologies: Update on the SETAC/ACLCA Working Group Progress," 2022 International Symposium on Sustainable Systems and Technology (ISST), Pittsburgh, PA, June 21-23, 2022.

64. ► **H. P. H. Liddell**, I. Atakpa, S. Brueske, A. Carpenter, and J. Cresko, "Cradle-to-gate burden shifting in lightweighting: an analysis framework and automotive case study," presented at the American Society for Life Cycle Assessment (ACLCA) 2021 Conference, virtual, September 21–24, 2021.

65. ► **H. P. H. Liddell** and M. H. Merrill, "Fracture mechanics of delamination in ballistic glass laminates," presented at the 43rd Annual Meeting of the Adhesion Society, Charleston, SC, February 23-26, 2020. Poster. ★

66. ► **H. P. H. Liddell**, G. M. Smith, and L. Erickson, "Extraction of mode mixity and other fracture data from crack paths in pull-off adhesion tests," presented at the 43rd Annual Meeting of the Adhesion Society, Charleston, SC, February 23-26, 2020. ★

67. ► **H. P. H. Liddell** and M. H. Merrill, "Enhancement of intimate surface contact for dry particle adhesion through mechanical property tailoring of a collection wipe," presented at the 42nd Annual Meeting of the Adhesion Society, Hilton Head, SC, February 17-20, 2019. ★

68. ► **H. P. H. Liddell** and M. H. Merrill, "Adhesion of explosive particles to textile swab surfaces," presented at the 2018 American Chemical Society Colloid & Surface Science Symposium, State College, PA, June 10-13, 2018.

69. ► **H. P. H. Liddell** and M. H. Merrill, "Swab texture effects in swipe sampling for explosives detection," presented at the 2018 Explosives Detection (TED) Workshop, Ottawa, Canada, April 9-13, 2018.

70. ► S. B. Brueske, **H. P. H. Liddell**, J. W. Cresko, and A. C. Carpenter, "Manufacturing energy bandwidth studies," presented at the 39th Industrial Energy Technology Conference, New Orleans LA, June 20-22, 2017. ★

71. ► W. R. Morrow III, S. Das, J. W. Cresko, and **H. P. H. Liddell**, "Net energy consequences of carbon fiber reinforced polymer composites in U.S. light-duty vehicle fleet lightweighting," presented at the 2016 Composites & Advanced Materials Expo (CAMX), Anaheim CA, September 27-29, 2016. ★

72. ► **H. P. H. Liddell**, S. B. Brueske, A. C. Carpenter, and J. W. Cresko, "Manufacturing energy intensity and opportunity analysis for fiber-reinforced polymer composites and other lightweight materials," presented at the 31st Technical Conference of the American Society for Composites, Williamsburg VA, September 19-22, 2016. ★

73. ► D. A. Sunter, W. R. Morrow III, J. W. Cresko, and **H. P. H. Liddell**, "The manufacturing energy intensity of carbon fiber reinforced polymer composites and its effect on life cycle energy use for vehicle door lightweighting," presented at the 20th International Conference on Composite Materials, Copenhagen, Denmark, July 19–24, 2015. ★

74. ► **H. P. Howard**, J. C. Lambropoulos, and S. D. Jacobs, "Dependence of thermal stresses on substrate thickness during wet processing of large coated optics," presented at OSA Imaging and Applied Optics Congress: Optical Fabrication and Testing, Monterey CA, June 24–27, 2012. [Published as H. P. Howard] ★

75. ► K. Mehrotra, **H. P. Howard**, S. D. Jacobs, and J. C. Lambropoulos, "Mechanical characterization of 'blister' defects on optical oxide multilayers using nanoindentation," presented at the 2012 Materials Research Society (MRS) Spring Meeting, San Francisco CA, April 9–13, 2012. [Published as H. P. Howard] ★

76. ► K. Mehrotra, **H. P. Howard**, S. D. Jacobs, and J. C. Lambropoulos, "Nanoindentation probing of high-aspect-ratio pillar structures on optical multilayer dielectric diffraction gratings," presented at the 2012 Materials Research Society (MRS) Spring Meeting, San Francisco CA, April 9–13, 2012. [Published as H. P. Howard] ★

77. ► **H. P. Howard** and K. Mehrotra, "Investigation of the blister defect on MLD gratings using nanoindentation and microscopy," presented at Nanomaterials Symposium 2011: Frontiers in Materials Science for the 21st Century, University of Rochester. Poster. [Published as H. P. Howard]

78. ► **H. P. Howard** and J. C. M. Li, "Interface flow mechanism for tin whisker growth," presented at the 18th Annual MRS Symposium on Materials Research 2010, University of Rochester. Poster. *(Honors: "Best Poster" in student poster competition).* [Published as H. P. Howard]

79. ► J. Cheng, J. Subjeck, **H. P. Howard**, P. T. Vianco, and J. C. M. Li, "Accelerated growth of tin whiskers from evaporated film," presented at The Minerals, Metals and Materials Society (TMS) Annual Meeting, San Francisco CA, February 15–19, 2009. Poster. *(Honors: third place in student poster competition).* [Published as H. P. Howard]

Other Published Materials

80. ► S. Gause, **H. P. Liddell**, C. Dollinger, E. Yüzügüllü, J. Steen, K. Morrissey, and J. Cresko, Environmentally Extended Input-Output for Industrial Decarbonization Analysis (EEIO-IDA) Tool. Software tool, beta version 1.0 (2023). Available at: https://www.energy.gov/eere/iedo/articles/environmentally-extended-input-output-industrial-decarbonization-analysis-eeio

81. ► **H. P. Liddell**, K. Ajmo, J. Steen, and T. Evans, "Life Cycle Assessment and Techno-Economic Analysis Training." Short video series on the DOE YouTube channel; ten modules posted from 2021-2023. Available at: https://www.energy.gov/eere/amo/life-cycle-assessment-and-techno-economic-analysis-training

82. ► J. Steen, **H. P. Liddell**, D. Thaller, R. Brasier, S. Brueske, and J. Cresko, Techno-economic, Energy, and Carbon Heuristic Tool for Early-Stage Technologies (TECHTEST). Software tool, version 1.0 (2023). Available at: https://www.energy.gov/eere/amo/techno-economic-energy-carbon-heuristic-tool-early-stage-technologies-techtest-tool