

EEE Research Seminar

Date: October 3, 2023, at 10:30 AM

Location: POTR 234 (Fu Room)

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Should We Lightweight Electric Vehicles? An Environmental Life Cycle Perspective with an Outlook to 2050

Abstract

This seminar will explore and quantify the forward-looking opportunity space for lightweight structural materials in battery electric vehicles. Leveraging a dataset of over 250 model year 2018-2023 battery electric models sold in the United States, I apply a top-down statistical approach to assess the potential environmental benefits of lightweighting from a life cycle perspective. This work considers both the vehicle cycle (materials) and the fuel cycle (electric vehicle charging). I will discuss the impacts of materials selection and the sensitivity of results to vehicle characteristics such as size and drive range. Analytical results show that lightweighting of electric vehicles can contribute meaningfully to an overall strategy to meet economy-wide decarbonization goals, even under rapid electric grid transition scenarios. However, net emissions impacts depend on specific material selections and manufacturing methods and benefits are not universally observed in all lightweighting scenarios. I will put these results in context to discuss the broader implications for environmentally conscious automotive materials development.

Bio

Heather Liddell joined Purdue in Fall 2023 as an Assistant Professor with a joint appointment in Mechanical Engineering and Environmental & Ecological Engineering. She studies resource use and environmental impacts in manufacturing, focusing on the identification and development of technical strategies for improving the sustainability of the U.S. industrial and transportation sectors. Core to this work is an integration of top-down strategies (e.g., supply chain modeling and sector-wide energy analysis) and bottom-up strategies (e.g., impact assessments at the technology, product, or process level). Prior to joining Purdue, Dr. Liddell was a senior scientist and group leader at Energetics, where she worked closely with the U.S. Department of Energy to develop strategies for resource-efficient and decarbonized manufacturing in the United States. Liddell holds BS and MS degrees in mechanical engineering and a PhD in materials science from the University of Rochester. She completed her postdoctoral training at the U.S. Naval Research Laboratory.