Transforming Transportation Planning and Policy for Safety

PI: Chris Hendrickson https://orcid.org/0000-0002-9812-3580,
Co-PI: Corey Harper https://orcid.org/0000-0003-1956-5258 and
Co-PI: Karen Lightman

FINAL REPORT

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16. Abstract

Transportation policy studies and improved planning are essential for furthering goals of the University Transportation Centers and the US Department of Transportation. This project is intended to build upon long-standing and successful activities in these areas. Four

tasks were accomplished. First, a database design and tracking process for Intelligent Transportation Systems (ITS) progress in the United States was devised. This activity was undertaken in partnership with ITS America. Second, research on safety policy improvements for battery electric vehicles was initiated with the goal of producing a new policy brief on this topic in 2024/2025. Audiences will be USDOT, USDOE and State officials. Safety concerns of interest include battery fires, vehicle sound, and vehicle weight. Third, project participants continued to work with Regional Industrial Development Corporation (RIDC) in the planning for Pennsylvania Safety Transportation and Research Track (PennStart). Fourth, project participants engaged in a variety of technology transfer and outreach activities. PennStart will be a $ 22M state funded transportation technology testing and traffic incident management training center in the Pittsburgh region. Connecting Pittsburgh and PennStart is a 'Smart Corridor' that will also be used for testing in the real world. PennStart capital expenditures will be used for project match. Carnegie Mellon researchers included Chris Hendrickson (Hamerschlag University Professor of Engineering Emeritus), Corey Harper (Assistant Professor of Civil and Environmental Engineering), and Karen Lightman (Executive Director of Safety21).

‘This project builds upon successful synthesis and policy projects undertaken with Mobility 21 UTC funding that have resulted in six policy briefs, professional papers and numerous public presentations.

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1. Introduction: Project Overview

This project builds upon four previous years of research, which has informed policymakers of disruptive transportation technology trends and provided guidance on policies to take advantage of opportunities and mitigate risk. The activity focus switched from mobility to safety research in this year's project. The work builds upon relevant research conducted by Safety21 with a strategic equity focus on 'Innovating Safety for All.'

The project accomplished several tasks:

- A database design and tracking process for Intelligent Transportation Systems (ITS) progress in the United States was devised. This activity was undertaken in partnership with ITS America.
- Research on safety policy improvements for battery electric vehicles was initiated with the goal of producing a new policy brief on this topic in 2024/2025. Audiences will be USDOT, USDOE and State officials. Safety concerns of interest include battery fires, vehicle sound, and vehicle weight.
- Project participants continued to work with Regional Industrial Development Corporation (RIDC) in the planning for Pennsylvania Safety Transportation and Research Track (PennStart).
- Project participants engaged in a variety of technology transfer and outreach activities.

Project personnel included:

Chris Hendrickson, Principal Investigator, is the Hamerschlag University Professor Emeritus, Director of the Traffic 21 Institute at Carnegie Mellon University, member of the National Academy of Engineering, and Editor-in-Chief of the ASCE Journal of Transportation Engineering Part A (Systems). His research, teaching, and consulting are in the general area of engineering planning and management, including, transportation systems, design for the environment, construction project management, finance, and computer applications.

Corey Harper, Co-Principal Investigator, is an Assistant Professor at CEE and Heinz School of Information Systems and Public Policy at Carnegie Mellon University. In his role as the director of the Future Mobility Systems Lab, he leads a team of researchers who explore the infrastructure, policy, and equity implications of emerging transportation technologies (e.g., autonomous vehicles and micromobility). The equity analysis side of his team applies equity metrics to assess how policy and regulation could affect the distributional equality of transportation resources. The modeling and simulation side of his group is focused on incorporating new mobility modes (e.g., micromobility and e-commerce) into regional traffic demand models to promote better long-range planning of the transportation system.

Karen Lightman, Co-Principal Investigator, is Executive Director of Safety21 as well as the Executive Director of Metro21: Smart Cities Institute at CMU. Karen is an internationally recognized leader in building and supporting communities based on emerging technologies. Her diverse background spans the consumer, military, healthcare, manufacturing, and automotive sectors. Karen is ranked by EETimes as one of the top 25 "Women in Tech." She is a passionate advocate and spokesperson for technology solutions to real-world problems and has held several board positions and is currently treasurer on the board of the MetroLab Network. She has a BA from the University of Vermont and a MS in Public Policy and Management from Carnegie Mellon University's Heinz College.

Several undergraduate and graduate Carnegie Mellon students assisted the primary personnel, including:

- Uzma Rauf, MS Student, Heinz School
- Sanjeev Naiac, Undergraduate, Engineering
- Jiacheng Wang, MS Student, Engineering

Data Management

This project involved literature review, some database design analysis, and meetings with transportation stakeholders. No datasets were developed and used in this work.

2. Intelligent Transportation System Tracking Database Design

In an era characterized by rapid technological advancements and the ever-evolving landscape of transportation, the integration of Intelligent Transportation Systems (ITS) has emerged as a transformative force, shaping the way we navigate and interact with our transportation infrastructure. Developing the "State of ITS" data-repository, seeks to create a comprehensive database that stores all relevant data about advanced ITS and mobility deployments across the United States. This endeavor envisions a comprehensive data repository that not only reflects the current state of ITS technologies but also provides a roadmap for future advancements.

Project personnel met with ITS America and developed working documents detailing potential database designs and user interfaces for a tracking system. By embracing cutting-edge methodologies and technologies, this initiative aims to empower policymakers, stakeholders, and industry in the transportation domain with invaluable insights, ultimately fostering a smarter and more sustainable transportation ecosystem.

After development of a potential design over the course of several meetings, ITS America decided that an appropriate business model would be to create a proprietary system with membership access. Carnegie Mellon Safety21 University Transportation Center desired an open access system so stopped further development and participation. ITS

America is pursuing a proprietary system.

3. Battery Electric Vehicle Safety Literature Review and Analysis

Media reports regularly express concern about the safety of battery electric vehicles (BEV). However, there is little comprehensive analysis of the comparative safety of BEV relative to comparable ICE vehicles. This task is intended to (1) survey existing literature, including relevant regulations and changes in safety risks over time, (2) identify research gaps, and (3) consider appropriate policies to improve the safety of BEVs.

Social goals motivate increasing the use of BEVs in the US transportation system. Coupled with clean electric power generation, BEVs can reduce transportation greenhouse gas emissions.[1] BEVs can also reduce the emissions of conventional air pollutants such as particulates. Safety concerns could be an impediment to widespread adoption of BEVs.

The literature survey is taking advantage of database tools such as TRID and Google Scholar. A taxonomy of potential risks has been developed and literature relevant to each risk categorized. To date, this work has been assembled into draft working papers.

The expected outputs from the work will be a peer-reviewed paper summarizing results and a policy brief accessible to policy-makers and the public. These outputs are expected from a follow-on project starting July 1, 2024.

4. PennStart Participation

Project Co-PI Karen Lightman was the primary project contact for PennStart Activities. She actively participated in PennStart planning committee meetings. The PennStart facility is currently in design and business planning.

As described on the PennStart website,[2] 'Pennsylvania Department of Transportation (PennDOT), the Pennsylvania Turnpike Commission, the Regional Industrial Development Corporation (RIDC) of Southwestern PA, Carnegie Mellon University and Westmoreland County are partnering to plan and design the Pennsylvania Safety, Transportation and Research Track, or PennSTART — a state-of-the-art facility envisioned to benefit emergency responders, transportation technology companies, and research institutions while supporting the local economy.

PennSTART's aim is to address safety, training, and research needs in six key areas: traffic incident management (TIM); tolling and intelligent transportation systems (ITS)

[1] National Academies of Sciences, Engineering, and Medicine. (2023). Accelerating Decarbonization in the United States: Technology, Policy, and Societal Dimensions.
[2] https://pennstart.org/

technology; work zones; commercial vehicles; transit vehicles; and AV and other emerging technologies.

The facility will be built at and adjacent to the RIDC Westmoreland site in Mount Pleasant.'

Prof. Rajkumar serves on the 8-member *PennSTART Operating Committee*, which is the Governing Board for PennSTART. Karen Lightman, Executive Director of Metro21 and Safety21, serves on the *Training Subcommittee* and *the Technical Subcommittee* for PennSTART. These committees meet regularly and actively to operationalize the initial phase of PennSTART. New track construction started in 2024 and the track is expected to be open in late 2025, early 2026.

Organizations that are working with RIDC on PennSTART include PennDOT, Pennsylvania Turnpike Commission, RIDC, Westmoreland County, and the Westmoreland County Community College. Additional organizations will be included as an AV Connected Corridor between Westmoreland and Hazelwood Green deployed.

In collaboration with PennSTART partners RIDC, PennDOT and the Pennsylvania Turnpike Commission (PTC), the PennSTART project has started to be promoted and socialized. A webpage was launched on the RIDC website. Other activities include Traffic Incident Management (TIM) training – to date there have been four trainings held onsite at PennSTART and more planned for the future.

5. Technology Transfer and Outreach Activities

- Project PI Chris Hendrickson served on the National Academies of Science, Engineering and Medicine Study Committee on Accelerating Decarbonization in the United States. A publication resulted in 2023 from the National Academies Press (see footnote 1).
- In November 2023, project Co-PI Corey Harper presented a Safety21 Smart Safety Connection seminar on "Advancing Towards a Smarter and More Sustainable Transportation System."
- Project PI Chris Hendrickson was co-chair and part of the planning committee for the 7th EU-US Symposium on Transportation Research, June 11-12 in Washington D.C. The theme of the symposium was 'Global Pathways to Net-Zero: Behavioral, Social, and Technological Research and Innovation Strategies for Transportation Decarbonization.' A proceedings volume will be available in 2024 from the National Academies Press.
- In December 2023, Project Co-PI Lightman joined the *Transportation Engineering and Safety Conference 2023 Conference* to discuss PennSTART at the Transportation Engineering and Safety Conference, hosted by Penn State College of Engineering. Ms. Lightman was joined by:
    - David DiGioia, Senior Project Manager, Bowman Consulting;

    - Keith Miller, Director of Site Development, Regional Industrial Development Corp.;
    - Joseph Sutor, Planning and Design Services Manager, Pennsylvania Turnpike Commission
- February 2024, Project PI Chris Hendrickson presented a seminar at University of California Berkeley Institute of Transportation Studies. The topic was 'Accelerating Deep Decarbonization for US Transportation Modes.'
- Project PI Chris Hendrickson moderated and Co-PI Corey Harper spoke at the "*Moving Things: Decarbonizing Freight Transportation*" panel at CMU's Energy Week, hosted by the Scott Institute for Energy Innovation in March 2024. Other Panelists included: Craig Philip, Professor, Civil & Environmental Engineering, Vanderbilt University; Carly Dobbins-Bucklad, Business Strategy, Ford Motor Company; and Michael Fetsko, President, Freight & Industrial Components, Wabtec Corp.
- In April 2024, project co-PI Lightman participated in the "ITS America Member Webinar Features Overview of PennSTART Facility and Transportation Safety" – Ms. Lightman was joined by Jim Katsafanas of Michael Baker International, Joseph Sutor of the Pennsylvania Turnpike Commission, and Keith Miller of RIDC for the ITS America Member Webinar, "Overview of the New PennSTART Facility and Focus on Transportation Safety.
- In May 2024, project PI Chris Hendrickson presented "Setting the Stage" at the roundtable on "Lessons Learned from the Francis Scott Key Bridge Collapse" at the University of Maryland.
- Project PI Chris Hendrickson has co-chaired a working group for the International Council of Academies of Engineering and Technological Sciences on Transportation Decarbonization. A report is expected to be approved next year: 'NAVIGATING THE FUTURE: A REPORT ON THE CURRENT STATE AND FUTURE PATH OF ENERGY TRANSITION IN THE TRANSPORT SECTOR,'