



Caltrans Division of Research,  
Innovation and System Information

# Research

# Notes

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Project Title:  
UTC-Quantifying the Effects of  
Vehicle Electrification Programs  
on Traffic Loads

Task Number: 3333

Start Date: January 1, 2020

Completion Date: Sept 30, 2021

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## Quantifying the Effects of Vehicle Electrification Program on Traffic Loads

This research explores the potential impacts of vehicle electrification on pavement.

### WHAT IS THE NEED?

Electric vehicles (EVs) tends to have a higher weight than a normal vehicle. The increasing vehicle weight is a concern for the maintenance and design of pavement and road infrastructure. This project will assess the impacts of vehicle electrification on the average axle loads for a range of vehicle classes. The study will then estimate the potential impacts to average traffic loads based on traffic composition and targets for increasing vehicle electrification out to 2050. This research will use a combination of life-cycle assessment (LCA) and life-cycle cost (LCC) methods to estimate environmental impacts and costs.

### WHAT ARE WE DOING?

Conducting a comprehensive review of peer-reviewed, grey literature, and available data examining mass of electric vehicles and forecasts of electric vehicle battery performance improvements. Estimating axle loads for different EV categories and forecast potential changes in axle loads based on changing models and improving battery systems. Then developing and refining a methodology for estimating pavement damages based on vehicle weight and estimate axle load damages.

### WHAT IS OUR GOAL?

Results from this analysis can also be combined with life cycle modeling of EVs to better understand the environmental consequences of their deployment and use. A white paper will detail the research findings and discuss a range of policy implications.



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## WHAT IS THE BENEFIT?

This study will explore the impacts of vehicle electrification policies on traffic loads in California. The proposed white paper will provide estimates of how increased vehicle electrification could impact axle weights, average traffic loads, and pavement damages. The research will support the state's EV policies and continued investments in roadway construction and maintenance.

## WHAT IS THE PROGRESS TO DATE?

### Task 1. Data collection and literature review (Progress – 100%) -

Literature review was completed and provided to the task officer - Project team has also released AB 2061 report on the effects of vehicle loads on pavements.

### Task 2. Model EV Axle Loads and Pavement Damage function (Progress - 100%) -

Project team finalized the review of objectives and next steps. Work plan focused on linking roadway lane miles by class from Caltrans with EMFAC vehicle activity and population data. This analysis linked pavement LCA by surface and roadway class with vehicle activity and population estimates to provide a holistic view of the emissions impacts of medium and heavy duty vehicle electrification - Project team also published the following related article: Jaller, M., Pineda, L., Ambrose, H., & Kendall, A. (2021). Empirical analysis of the role of incentives in zero-emission last-mile deliveries in California. Journal of Cleaner Production, 128353.

### Task 3. Estimate Impacts to Traffic Loads (Progress - 90%) -

Project team met to discuss next steps. Project team agreed to obtain updated fleet projection data and incorporate those fleet projections into existing damage methodology developed in AB 1550 report. Project team finalized those analyses but has not met to develop the final project report.

### Task 4. White Paper (Progress -80%) -

Project team met (7/2021) to discuss white paper outline and assign tasks. They have developed a plan to complete a draft of the final paper by the end of February 2022.