

# Research Stage 1 Problem Statement

**PROPOSED TITLE:** Integration of Electric Vehicle Charging Demand into Traffic Signal Timing

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## **1. Concisely describe the transportation issue (including problems, improvements, or untested solutions) that Oregon needs to research.**

Oregon's growing adoption of electric vehicles (EVs) is increasing demand for public charging infrastructure and influencing travel and dwell patterns near charging locations. However, current traffic signal timing practices do not explicitly account for EV charging demand, which can create localized and sometimes recurring surges in traffic, access and egress movements influenced by adjacent signal operations, possible queue spillback from charging stations that may disrupt normal traffic flow, and parking maneuvers or multimodal activity occurring around charging sites.

As Oregon continues expanding its EV charging network, including fast-charging hubs, curbside chargers, and installations near signalized corridors, there is limited research on how these facilities interact with traffic operations or how signal timing might be adapted to mitigate relevant impacts such as queueing, delay, safety concerns, and unreliable travel-time performance.

There is a need to explore and test policies, strategies, and operational tactics that integrate EV charging demand into signal timing development, evaluating how charging activity influences intersection operations, identifying measurable impacts on corridor performance, and assessing timing solutions that advance ODOT's safety, mobility, reliability, and sustainability goals.

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## **2. What final product or information needs to be produced to enable this research to be implemented?**

This research should produce practical outcomes that facilitate ODOT and partner agencies' efforts to incorporate EV charging demand into traffic signal timing practice. Some expected findings include, but are not limited to:

1. A comprehensive investigation in Oregon and literature review describing how EV charging activity influences traffic operations and how those patterns can be integrated into signal timing evaluation and updates.
2. Developing methods and performance metrics that quantify the operational impacts of various types of charging stations (e.g., fast chargers, curbside chargers, transit-adjacent chargers) in Oregon-specific context.
3. Data integration strategies using available datasets, such as charging session data, traffic counts, controller logs, probe trajectories, and parking activity, to support operational decision-making.
4. Recommended timing strategies or design treatments (e.g., phasing adjustments, pedestrian timing updates, queue mitigation measures) tailored to different charging station contexts.

5. Case studies evaluating potential solutions with current ODOT’s traffic signal facilities. Hardware-in-the-loop simulation integrated with ODOT’s traffic signal controllers could be desirable to ensure proposed strategies and treatments are readily implementable.
6. Implementation guidance that outlines required data resources, deployment considerations, and a roadmap for incorporating EV charging demand into future signal timing and system management practices.

The research findings may support future updates to the ODOT Traffic Signal Design Manual (January 2025) by providing additional design and operational considerations related to EV charging demand. Likewise, the results could supplement the ODOT Traffic Signal Management Plan (April 2020) by introducing new operational scenario context and identifying potential strategies and tactics for managing traffic near EV charging facilities.

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**3. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.**

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Mark Rahman	R1 Signal Manager	Mark.RAHMAN@odot.oregon.gov	971-284-9767

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**4. Other comments:**

Integrating EV charging demand into traffic signal timing considerations is a novel research area, but it shares similarities with signal timing and access management strategies used during traffic incidents or other atypical operating conditions. As Oregon works to support and expand EV adoption, traffic signal timing treatments may be needed to improve EV users’ accessibility and safety when traveling to and from charging stations, both during normal conditions and under special circumstances such as severe weather or emergency operations.

At the same time, signal timing treatments developed considering EV charging demand should minimize impacts on general road users and surrounding neighborhoods. A comprehensive investigation into how EV charging demand affects traffic operations, combined with the development of inclusive signal timing treatments that balance the needs of EV users, general traffic, and local communities, will be a central focus of this research.

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**5. State of Oregon Decision Making Lenses**

State decision making lenses are a part of the state of Oregon’s policy structure. State policy and federal policy are not always aligned. The state will prioritize research according to state policy, however ODOT may be required to skip prioritized proposals based on constraints placed on the use of federal funds. If state funds are available ODOT will attempt to fund prioritized research that is deemed ineligible for federal funding.

Please complete the following three sections. Your answers to these questions will be applied on a programmatic basis to support agency decisions. Answering yes to the questions below is not required. Resolving a narrowly focused technical research problem may meet agency needs without answering yes

to any of the following questions. The ODOT Research Section will seek a balanced portfolio some projects will answer yes to one of the three categories below (e.g. climate, equity, and/ or safety) and other projects in a different category.

We are looking for an overall program balance and no one project is expected to balance all categories. Generally, a research problem statement is expected to be able to answer yes with clear and verifiable information in only one of the three categories below, some projects may be able to answer yes in two or even three categories. Some projects (i.e. needs focused on specific elements of infrastructure design), may have no 'yes' answers but may still be a high value research need.

## *Climate*

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. To that end, we seek research that reduces carbon emissions from construction activities and materials, and from maintenance equipment and operations. Oregon envisions a transportation system that is resilient, this means a system that is durable in the face of seismic events and extreme weather to avoid negative impacts, withstand them or bounce back quickly to resume system function. We seek research that improves the ability of the transportation system to adapt or cope with more frequent and extreme weather events. This may include innovations in data and data sharing, construction materials and project design, communication, emergency planning and response, and more. Similarly, we seek research that avoids negative impacts on key habitats and ecosystems that can buffer or reduce damage to infrastructure and improve environmental conditions for wildlife and native vegetation. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#) and [Oregon Transportation Plan](#).

5a. Will addressing the transportation issue identified as a need in Question 1 develop, or **validate methods for the estimation, measurement, or monitoring** of transportation generated greenhouse gases (GHG)?

☐ Yes

☒ No

☐ Unsure

5b. If climate or GHG is not the focus of this **transportation issue** identified in this problem statement, will the research apply a GHG analysis to transportation infrastructure, planning, operations, maintenance, or materials?

☐ Yes

☒ No

☐ Unsure

5c. Will addressing the **transportation issue** include development or testing of construction practices, methods, or materials to establish potential reductions in greenhouse gas emissions?

☐ Yes

☒ No

☐ Unsure

5d. Will solving the **transportation issue** in question 1 study or support the reduction of vehicle miles traveled and single occupancy vehicle travel or support transition to electric vehicles (or other types of zero emission vehicles) or low-carbon alternative fuels?

☒ Yes

☐ No

☐ Unsure

5e. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, or monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☒ Yes☐ No☐ Unsure

5f. Will solving the **transportation issue** in question 1 lead to work that may result in better environmental conditions for wildlife and native vegetation?

☐ Yes☒ No☐ Unsure

5g. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

Integrating EV charging demand into traffic signal timing facilitates convenient and reliable access to EV charging locations encourages broader EV adoption, supporting statewide efforts to reduce greenhouse gas emissions from the transportation sector.

In addition, it can support Oregon's climate goals by reducing unnecessary delays, idling, and stop-and-go conditions near charging facilities. More efficient access to charging stations improves overall corridor flow, which can lower emissions for all vehicles.

### Equity

Equity can have many dimensions and impacts relating to communities and transportation. It is important that problem statement proposals clearly explain the equity dimensions or impacts being examined. Oregon commits to social equity in the OTP, specifically to *improve access to safe and affordable transportation for all, recognizing the unmet mobility needs of people who have been systemically excluded and underserved. Create an equitable and transparent engagement and communications decision-making structure that builds public trust.* We seek research that studies elements of this goal or applies analysis to specific transportation topics to ensure the resulting research recommendation is consistent with agency equity goals. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#) and [Oregon Transportation Plan](#).

5h. Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐ Yes☒ No☐ Unsure

5i. If the **transportation issue** is not focused on transportation equity, will the primary topic be assessed for equity benefits or impacts within the research project?

☐ Yes☒ No☐ Unsure

5j. Is the implementation of potential findings from this research likely to directly involve participation from an identified group that would benefit from an equitable process or outcome?

☐ Yes☒ No☐ Unsure

5k. Is the intended final product or information expected to support ODOT's equity efforts (Including but not limited to supporting one of the equity related objectives of the [ODOT's Strategic Action Plan](#) or [Oregon Transportation Plan](#)) ?

☐ Yes☐ No☒ Unsure

5l. If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

The anticipated research could advance ODOT’s equity goals by helping ensure that traffic signal timing treatments around EV charging stations consider the needs of all users, including pedestrians, bicyclists, transit riders, and residents in nearby neighborhoods. Developing inclusive timing strategies that minimize adverse impacts on surrounding communities and improve safe access to charging for all users.

### Safety

Research outcomes may include interventions and countermeasures to prevent or reduce the frequency of crashes or other causes of transportation-related injury or death; or may include measures to reduce severity of injury (including prevention of death) after a crash or other injurious event. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#), [Oregon Transportation Safety Action Plan](#) and [Oregon Transportation Plan](#).

5m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☒ Yes

☐ No

☐ Unsure

5n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☐ Yes

☐ No

☒ Unsure

5o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☐ Yes

☐ No

☒ Unsure

5p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☒ Yes

☐ No

☐ Unsure

5q. Will solving the **transportation issue** support improving safety through **investing strategically**? 5r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

Incorporating EV charging demand into signal timing can enhance safety by addressing operational challenges that may arise around charging sites, such as queue spillback, irregular turning movements, and access/egress conflicts. Signal timing strategies can help mitigate these risks by improving predictability, reducing conflicts, and supporting safer access for EV users while maintaining safe conditions for general traffic and vulnerable roadway users.

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## 6. Corresponding Submitter’s Contact Information:

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## 7. ODOT Sponsor Contact Information (Required if Submitter is not an ODOT employee)

Name:	Chris Primm
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This form is not a grant application or contract document. Please do not include proprietary information on this form. Once this form is received ODOT may revise and publish the problem statement. If selected, ODOT will assign investigator(s) of the department's choosing to conduct research.