



Charles D. Baker, Governor
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2021 RESEARCH PROJECT STATEMENT

Research Topic:

Carbon-Neutral Drop-In Transportation Fuels, Literature Review

Research Budget and Timeline:

- \$30,000-\$40,000
- 6-12 months (of which final 3 months are for review)

Problem Statement and Objectives

The Office of Transportation Planning Sustainable Transportation Section seeks to analyze carbon-neutral drop-in transportation fuels with a focus on the tailpipe emissions associated with these hydrocarbon fuels. The objective will be to examine the existing research on tailpipe emissions for carbon-neutral drop-in transportation fuels.

Drop-in carbon-neutral hydrocarbons are a potentially attractive option for MassDOT and potentially others due to their high gravimetric and specific energy densities compared with other low-GHG energy carriers e.g. hydrogen and batteries, making them potentially suited to heavy duty vehicles and aviation. They also forgo the need to establish new energy distribution and charging infrastructure and do not have the cold weather performance issues that face users of batteries and biodiesel.

Definitions for Terms within this Research Proposal

Carbon-neutral drop-in transportation fuels: Fuels produced via processes that remove carbon from the biosphere that can be distributed and utilized by existing infrastructure, vehicles, and engines. These processes include direct carbon-capture from the air, the harvesting/conversion of biomass produced for carbon storage into hydrocarbon fuel, and water electrolysis. Ethanol and biodiesel would *not* be considered under this definition, given that they require significant modifications to existing engines and face cold weather performance issues.

Tailpipe Emissions: Measurements of vehicle-produced relevant criteria air pollutants (CAPs) as defined by the U.S. EPA: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide.



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Anticipated Outcomes and Deliverables

A detailed report summarizing the existing data and research on carbon-neutral drop-in transportation fuels' tailpipe emissions. This should include a recommendation on whether the research already conducted on this topic is sufficient in its breadth and depth to provide MassDOT with conclusive evidence on the tailpipe emissions impacts of these fuels (in relation to traditional hydrocarbon fuels).

Deliverables:

1. Final Report
2. Final Presentation