Geospatial Decision Support Tool for Trucking Fleet Decarbonization

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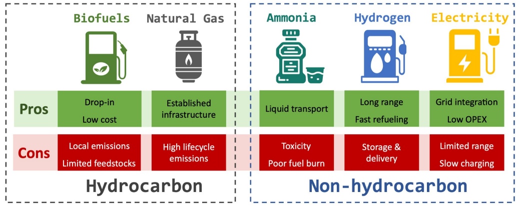
Introduction



Complex Solution Landscape: There is an impressive range of alternative fuels and powertrains under development and, increasingly, commercially available to decarbonize heavy duty trucking.

Decision Paralysis: Stakeholders in the trucking industry report decision paralysis when faced with the range of decarbonization solutions. They see a lack of tools to support fleet owners in navigating the transition to alternative fuels and powertrains to decarbonize their fleets in their region.

Concept: Help stakeholders overcome decision paralysis by developing a geospatial mapping tool with a variety of layers to support informed regional assessment of fleet decarbonization options.

Methods

1. **Understanding pain points:** Interviewed industry stakeholders to understand what critical decision-making resources are currently lacking.
2. **Data gathering:** Draw data relevant to decision-making from public sources.
3. **Data Integration:** Integrate data and combine with geospatial vector data to produce decision support layers.
4. **Data visualization:** Layers are visualized using a platform called QGIS.

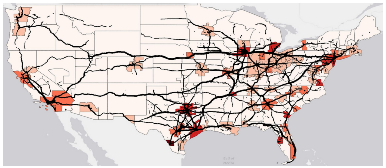


Figure 1: Lifecycle Emissions Associated with Freight Flows

*Freight flow data from the **FAF5 database** is statistically combined with vehicle usage data from the **VIUS**, along with emission estimates from the **GREET tool** to evaluate lifecycle emissions associated with freight flows in the U.S.*

Highlights

- Geospatial decision tool to support stakeholders in the trucking industry.
- Integrates data from many sources to support regional assessment of opportunities for fleets to transition to alternative fuels and powertrains.

Impact

- Help stakeholders overcome decision paralysis.
- Accelerate adoption of alternative fuels and powertrains.

Results

Proof of concept: Identify and rank candidate electrified trucking corridors

Initial analysis identified Dallas Fort-Worth (DFW) as a high-export region. Figure 2 shows exports originating from DFW to identify major candidate corridors to other regions. Mapping layers are used to rank the candidate corridors according to 5 criteria.

Criterion #1: Large highway flux connecting regions.
Criterion #2. Presence of public DC charging stations.

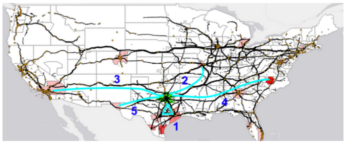


Figure 2: Exports from DFW (million ton-miles / square mile)

Public DCFC Chargers

Criterion #3: Low emissions intensity of the electrical grid along the way.

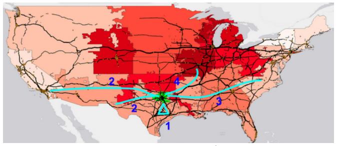


Figure 3: Grid CO_2e Intensity (lb CO_2e / MWh)

230 – 1600

Criterion #4: Low electricity price along the way

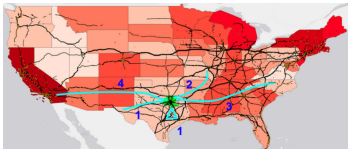


Figure 4: Commercial Electricity Price (cents / kWh)

8 – 30

Criterion #5: Low demand charge along the way

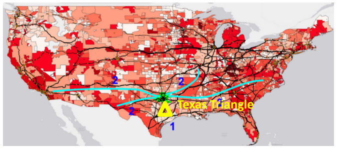


Figure 5: Maximum Demand Charge by Utility ($ / kW)

0 – 90

Findings: Based on the 5 criteria rankings, the **Texas Triangle** is identified as the most promising electrified trucking corridor.

Future Work:

- **Web-based tool:** Transitioning the tool to a web hosted platform for interactive use.
- **Scenario analysis:** Project the future evolution of regional transportation emissions under alternative market penetration scenarios of different alternative fuels and powertrains.

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Blog post on the tool

SCAN ME

References:

FAF5 Database: Hwang, Ho-Ling, et al. *Freight Analysis Framework Version 5 (FAF5) Base Year 2017 Data Development Technical Report*. 2021.

VIUS: VIUS *2002 Economic Census Vehicle Inventory and Use Survey*. U.S. Census Bureau, Dec. 2004

GREET tool: Argonne National Laboratory. *The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model*. 2022, greet.es.anl.gov/