ZERO EMISSION FREIGHT FUTURE (ZEFF) REPLICATION PLAYBOOK

Created by project lead:
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CLEAN FUELS OHIO

Project Introduction

The Zero Emission Freight Future (ZEFF) project is designed to demonstrate the real world economic and operational viability of medium- and heavy-duty Electric Vehicles (EVs) in fleets and communities.

The ZEFF project brings together data sets from a variety of medium- and heavy-duty EVs running real routes in real operations. The relationships built, data collected, and demonstrated solutions seek to inform fleets and other community partners about best practices and lessons learned for successful medium- and heavy-duty EV deployment.

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Project Partners

CFO CLEAN FUELS OHIO

SAWATCH LABS a WEX™ company

PITT OHIO SUPPLY CHAIN ▪ GROUND ▪ LTL ▪ TL

VOLVO

BIMBO® Bakeries USA

MOTIV Electric Trucks

OKproduce

Additional Project Advisory Committee Members

Ohio Department of Transportation

HNTB

BLACK & VEATCH

Electrification Coalition

COLUMBUS PARTNERSHIP

VIRGINIA CLEAN CITIES

Kansas City Regional Clean Cities

WISCONSIN CLEAN CITIES Established 1994

UTAH CLEAN CITIES
Clean Fuels • Clean Strategies • Clean Air

Project Timeline

2020/2021

Project Approval

Working with PAC members to create a data collection and analysis plan

2022

EV delivery

Data collection and preliminary analysis

Adapting light-duty analysis tools to medium/heavy duty needs

2023/2024

Data collection and continued analysis

Gathering testimonials and lessons learned

Obtaining the Vehicles – Vehicles in the Project

- **2** — *Class 7, Heavy-Duty Volvo EV Straight Trucks in Midwest Logistics Operations*
- **1** — *Class 6, Medium-Duty Motiv EV Delivery Step Van in Bakery Delivery Operations*
- **10** — *Class 8, Heavy-Duty Freightliner e-Cascadias in West Coast Produce Delivery Operations*

Obtaining the Vehicles – Successes & Lessons Learned

- The ZEFF project included data from vehicles that had been deployed specifically for the project AND data from vehicles deployed before the fleet joined the project
- One fleet was able to provide multiple vehicle data sets by applying for a state grant and timing the delivery of the vehicle with the beginning of the ZEFF project
- Multiple fleets experienced vehicle delivery delays due to supply chain issues after the COVID-19 pandemic
- One fleet's motivation for adopting EVs stemmed from leadership culture and an explicit health-, and environment-conscious mission
- Each fleet conducted their own assessment to understand which area of operations is best suited for EVs

Obtaining the Vehicles – Recommendations

1. Research available local, state and federal incentives to help offset the initial cost of EVs and infrastructure

   The U.S. Department of Energy Office of Energy Efficiency & Renewable Energy has a Laws & Incentives Tool that allows fleets to research Federal and State Laws and Incentives

2. Complete an internal assessment ahead of time to ensure the EV is being placed where it will be most effective in your operations

   Unsure of where to start? Contact your local Clean Cities and Communities Coalition by using the U.S. Department of Energy Coalition Locator Tool

   The U.S. Department of Energy and Argonne National Lab have developed the publicly available AFLEET tool to help fleets understand their vehicle TCO, emissions, and more.

3. Communicate with vehicle OEM consistently to get ahead of potential vehicle delivery delays

Collecting Data – Determining Data Points

The project's analysis model was adapted from project partner Sawatch Labs' "ezEV" analysis tool for light-duty vehicles

To help inform the analysis model, the following data points were requested:

- Gross Vehicle Weight Rating (GVWR)
- Curb Weight
- Battery Capacity
- Estimated Range (Optional – if available)
- Estimated Manufacturer's Suggested Retail Price (MSRP)
- Motor Count
- Motor kW Draw
- Accessory Equipment Draw

Collecting Data – Successes & Lessons Learned

Not all telematics providers are the same. Some telematics providers may not track key metrics like State of Charge. This type of data is important to understanding battery performance, range, operational efficiency and more.

Data collection delays can occur for a variety of reasons (e.g. vehicle delivery delays, no pre-installed telematics before vehicle delivery, installation delays, user error, etc.)

Utilizing public charging with fluctuating rates make charging costs a variable expense, thus making TCO calculations more difficult to run.

Significant differences exist between solutions for light-duty operations and medium- and heavy-duty operations. Software solutions are a helpful addition to monitor data and ensure operational optimization.

Not all OEMs collect and share data in the same way – communication with OEM partners about what data the fleet can and will have access to through the partnership will help ensure deployment success.

Collecting Data – Recommendations

1. Discuss pre-installed telematics or telematics capabilities of vehicle before purchasing. Understand what data the OEM provides, what data the charging equipment provides to the fleet, and what data the fleet needs to access to maximize operational efficiency and report metrics

2. Upon vehicle delivery, ensure data is being received through telematics device or platform

3. Keep lines of communication open with OEM, telematics partner, software provider, and charging company to ensure accurate TCO and other modeling calculations

Vehicle Operation – What Telematics Can Provide

ICE to EV Vehicle Comparison

- Operational Savings
- Fuel Reduction (Gallons)
- Fuel Cost Savings
- GHG Emissions Reductions (lbs)
- Avg Daily Electric Miles
- Avg Operational Savings per EV
- Missed Electric Miles

Vehicle Operation – Emissions Reduction in Detail

Emissions Reduction Information

GHG Tons Saved (including GHG from kWh gen)

Carbon Dioxide Tons Saved (Tailpipe)

Carbon Monoxide lbs Saved (Tailpipe)

NOx lbs Saved (Tailpipe)

PM10 in Grams Saved (Tailpipe)

PM2.5 in Grams Saved (Tailpipe)

Vehicle Operation – Successes & Lessons Learned

Vehicle assessment models are built with good assumptions about missing data (i.e., substituting average price per kWh in order to estimate charging costs) but the more information the fleet can gather to replace these assumptions, the more accurate the assessment.

Technology advances at such a rapid pace that historical data is difficult to rely on. One fleet mentioned that because battery chemistry has changed so significantly, original degradation calculations were much too conservative (i.e., the fleet is seeing higher states of health on their batteries which is changing their TCO calculation).

Operating an EV is different from operating a diesel vehicle. One fleet mentioned they needed to educate drivers on operational best practices and anti-idling best practices to make sure the vehicle range would last the full route.

Vehicle Operation – Recommendations

1. Collect and share as much data as necessary with telematics provider. This will provide a clearer picture of operating an EV as opposed to a diesel or gas vehicle.

2. Because of the speed of technological development, it can be difficult to gain a realistic perspective on the lifecycle of some EV components. Enough time to observe and monitor performance is needed to determine operational effectiveness.

3. Prepare to train drivers and other vehicle operators on best practices for operating EVs. This time investment will decrease user error, protect battery health, and ensure operational efficiency.

Summary

Identify area of operations best suited for EVs

- Utilize AFLEET tool
- Connect with local Clean Cities and Communities Coalition

Research available State and Federal incentives

- Utilize Alternative Fuel Data Center Incentive Finder Tool

Engage in discussions with OEMs before purchasing

- Understand data capabilities
- Discuss after-market support
- Discuss integrations with telematics partners
- Gain understanding of vehicle delivery timeline

Engage in discussions with charging providers and electric utilities

- Understand what data is available from chosen charging infrastructure provider
- Learn about potential integrations with third party software providers
- Learn about special rates (TOU or otherwise) from utility

Train drivers and other vehicle operators

- Work with OEM to see if they provide training program
- Connect with local Clean Cities and Communities Coalition to learn about training programs

Set up fleet assessment plan

- How frequently is the data being revisited
- How is TCO being calculated
- How can the data be presented back to leadership: GHG emissions reductions, justification for vehicle turnover, cost savings, ESG goals

Resources

- AFLEET Tool
- Joint Office of Energy & Transportation Drive Electric Website
- Clean Cities and Communities Locator
- Alternative Fuels Data Center Federal Laws & Incentives Search
- Alternative Fuels Data Center Electric Vehicle for Fleets Information
- Alternative Fuels Data Center Electric Vehicle Infrastructure Toolbox

Acronym Deck

- AFLEET Tool: Alternative Fuel Life-Cycle Environmental and Economic Transportation Tool
- GHG: Greenhouse Gas
- ICE: Internal Combustion Engine
- kWh: Kilowatt-Hours
- NOx: Nitrous Oxide
- OEM: Original Equipment Manufacturer
- PAC: Project Advisory Committee
- PM10: Particulate Matter with diameter of 10 micrometers
- PM2.5: Particulate Matter with diameter of 2.4 micrometers
- TCO: Total Cost of Ownership
- TOU: Time of Use