

ZERO EMISSION FREIGHT FUTURE (ZEFF) REPLICATION PLAYBOOK

Created by project lead:
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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.

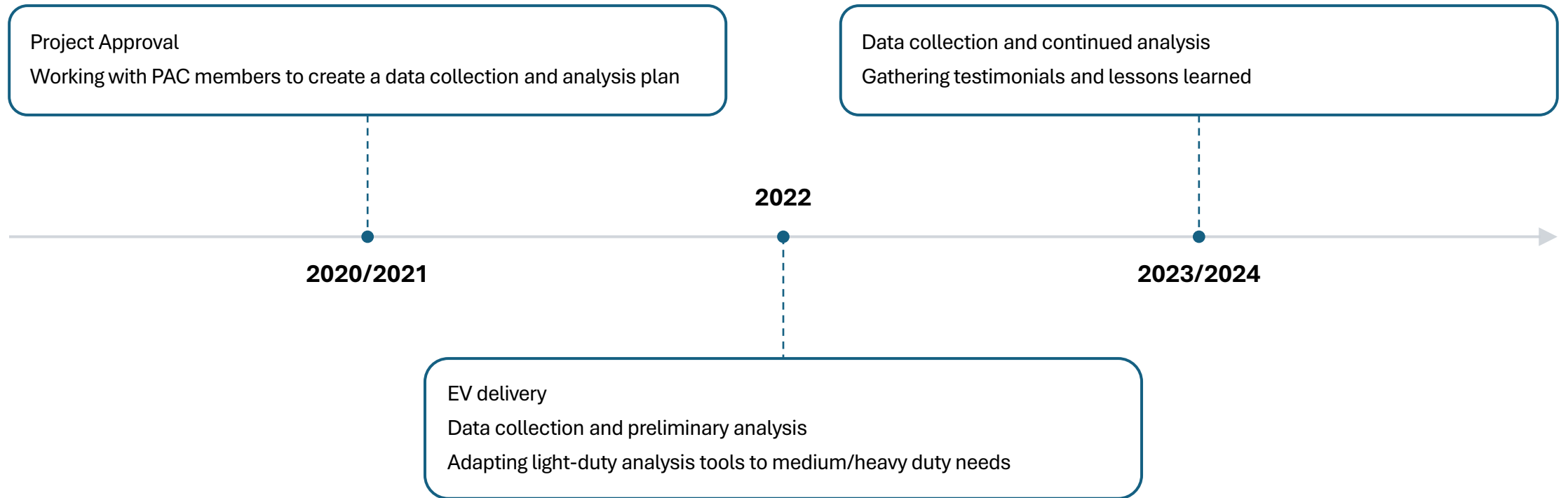
Project Partners



Additional Project Advisory Committee Members



Project Timeline



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).

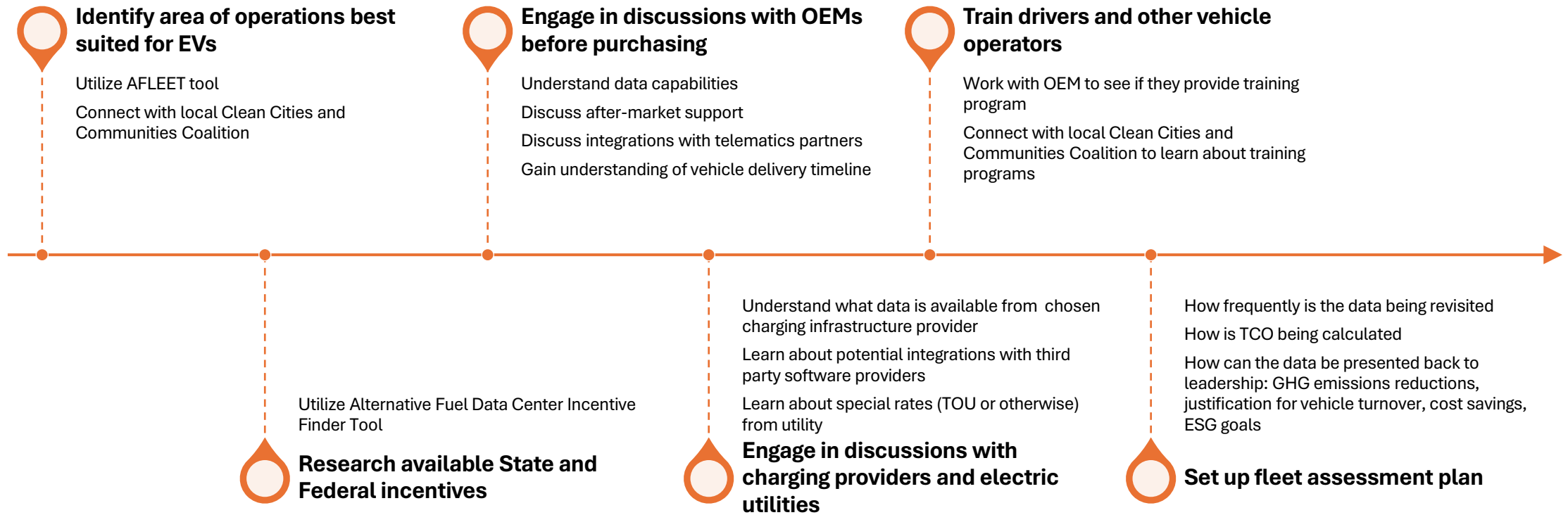


Operating an EV is different from operating a diesel vehicle. One fleet mentioned they needed to educate drivers on operational best practices and anti-idling best practices to make sure the vehicle range would last the full route.

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



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