FEMP ZEV Planning Resources
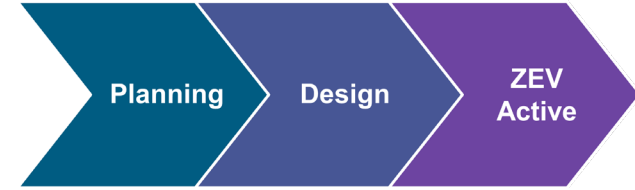
Jesse Bennett, NREL
Mark Singer, NREL

🌐 www.gsa.gov/FedFleet

The ZEV Ready Solution

Framework to **simplify and guide fleets through the process** to electrify each fleet location

Planning → **Design** → **ZEV Active**
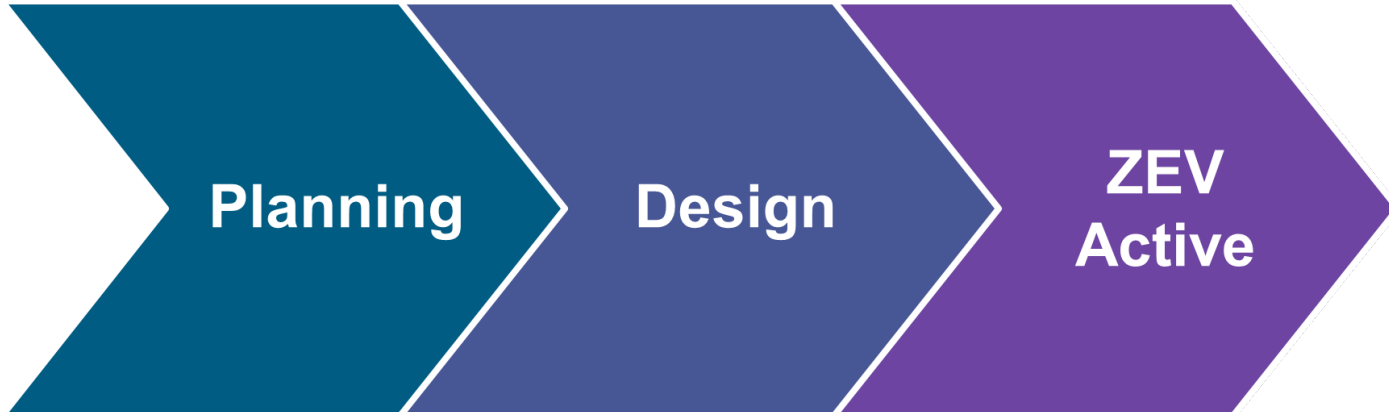
15 Steps to Electrification

- The three-part framework is organized into 15 steps designed to simplify the site-level planning for electrification

https://www.energy.gov/femp/federal-fleet-zev-ready-center

Stakeholder Engagement

- ZEV Ready outlines the steps where each key stakeholder should be involved

- The process is organized into 4 planning component areas to track completion

Fleet Tools for ZEV Ready Analysis

Planning

Step 1	Step 2	Step 3	Step 4
Identify and coordinate team	Review training materials	Review requirements, goals, and data	Align headquarters strategy with site planning
Team Ready	Team Ready	Commitment Ready	Commitment Ready

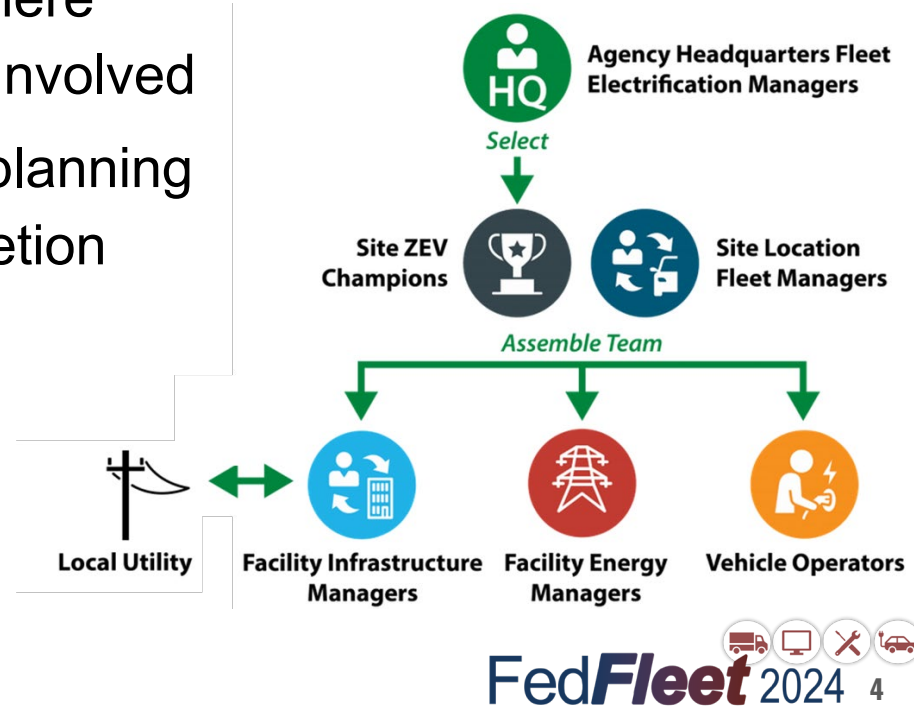| Step 5	Step 6	Step 7
Identify ZEV opportunities	Identify EVSE opportunities	Coordinate site financial planning with headquarters
Vehicle Ready	Charging Ready	Commitment Ready

Design

Step 8	Step 9	Step 10	Step 11
Engage with key electrification stakeholders at site	Coordinate with local utility service	Complete site assessment and design EVSE	Identify EVSE at non-agency locations
Team Ready	Charging Ready	Charging Ready	Charging Ready

Step 12
Work with leadership to secure EVSE funding
Commitment Ready

ZEV Active

Step 13	Step 14	Step 15
Acquire ZEVs and EVSE	Install and activate EVSE	Support drivers in using ZEVs and EVSE
ZEV Ready	ZEV Ready	ZEV Ready

Initial Scoping

Technical Design

Vehicle Management

https://www.energy.gov/femp/federal-fleet-zev-ready-center

FEMP Tools and Resources

Tools/resources developed by FEMP and referenced throughout ZEV Ready

- **Technical Training**
  - EV Champion Training, Short Video Series, Worksheets, Review Materials

- **EVI-LOCATE**
  - Automated tool to support virtual site assessments and EVSE cost estimates

- **Case Studies**
  - Short summaries of electrification solutions currently in use by the federal fleet

- **Reports and Program Guides**
  - Detailed summary reports from various projects and program guide documents

- **FleetDASH, ZPAC, and much more!**

https://www.energy.gov/femp/fleet-electrification-and-optimization

FEMP Technical Training

- EV Champion Training
  - 4-part webinar series on fleet electrification basics
  - Supplementary worksheets
  - Short review videos on YouTube
- Regular meetings on new and upcoming resources
  - INTERFUEL (quarterly)
  - FEVAR (monthly)

EV TECHNOLOGY OVERVIEW

EV FINANCIAL CONSIDERATIONS

EVSE INFRASTRUCTURE

DRIVING ELECTRIC VEHICLES

https://www.energy.gov/femp/fleet-electrification-step-2-review-zev-and-evse-training-materials

EVI-LOCATE

(Electric Vehicle Infrastructure-Locally Optimized Cost Assessment Tool and Estimator)

Automated tool for virtual site assessments

1. Drag and drop tool > Users select EVSE location
2. Siting algorithm estimates trenching distances
3. National Electrical Code drives electrical upgrades
4. Calculator estimates material, labor, and soft costs

New 100-A 3Φ Service Panel

Existing 75 kVA 480-208 V Step-down Transformer

Existing 750 kVA 480 Secondary Transformer

For NREL Parking Garage (Army - Denver - Colorado)

Estimated Cost of EVSE Installation
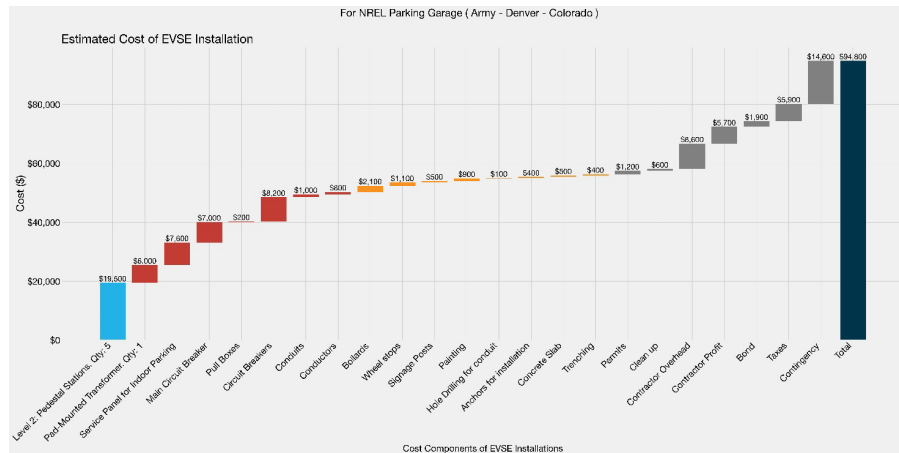
New Resources Coming Soon!

- New and Improved Tools
    - ZPAC and FleetDASH Updates
    - EVI-LOCATE Dashboard and DCFC
    - EVI-Ratio Development

- Training/Resources
    - EV Champion Training 2.0
    - ZEV Ready Updates
    - EVI-LOCATE Videos
    - HTW EV Program Guide
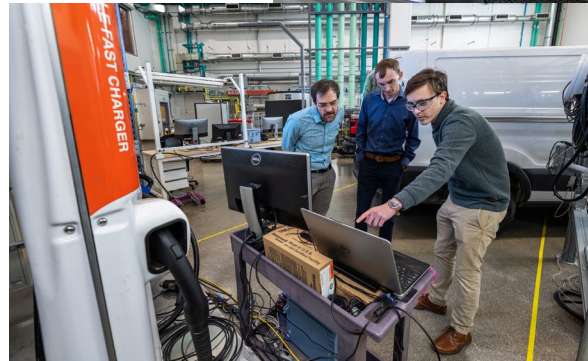
FleetDASH and ZPAC for ZEV Planning

FleetDASH and ZPAC provide ZEV fleet evaluation frameworks based on agency data.
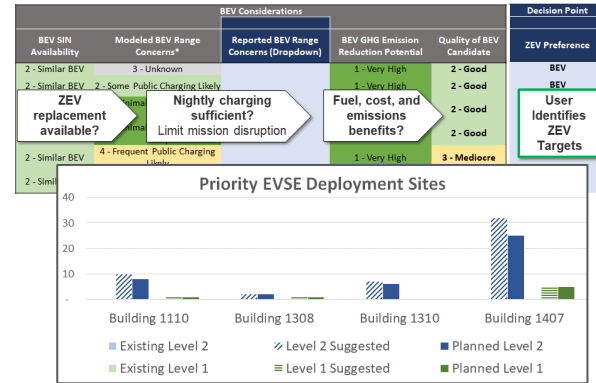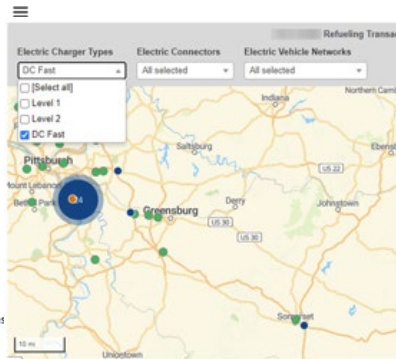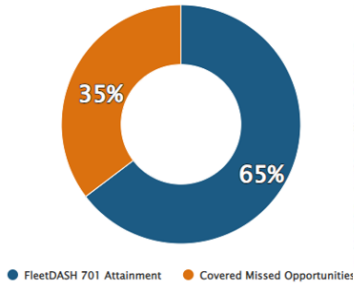
FleetDASH:

- Web application
- Track detailed fleet fueling behavior
- Target ZEV acquisitions

https://federalfleets.energy.gov/FleetDASH

ZEV Planning and Charging Tool (ZPAC):

- Excel based tool
- Sitewide or fleetwide ZEV planning
- Plan ZEV acquisitions and EVSE installs

FleetDASH Fleet Mandate Support

1. Use alternative fuel including electricity

2. Acquire alternative fuel vehicles (AFVs) & zero emission vehicles (ZEVs)

Legislative Mandates
EPAct 1992: 75% LD vehicles AFVs
EPAct 2005, section 701: Alt fuel in dual-fuel vehicles
EISA 2007, section 142:
• Increase alt fuel use
• Decrease petroleum use
EISA 2007, section 246: Install renewable fuel pump

Executive Order 14057
Section 205 (ii):
• 100% ZEV LDV acquisitions by FY 2027
• 100% ZEV acquisitions by FY 2035
• Annual Zero-Emission Fleet Strategic Plan

https://www.energy.gov/femp/federal-fleet-requirements-resource-center

FleetDASH Data Source

Fuel transaction data
- Date of transaction
- Address of fuel purchase
- Vehicle fuel type
- Fuel type purchased
- Fuel quantity purchased

Fleet inventory data
- Organization
- Make, model, year
- Vehicle type
- Law enforcement/ emergency response
- Mileage

Transaction Summary:
- ✓ January 12, 2021
- ✓ 15065 W Colfax Ave Golden, CO 80401
- ✓ E85 capable vehicle
- ✓ Gasoline purchase
- ✓ 13 gallons

© MapTiler © OpenStreetMap contri
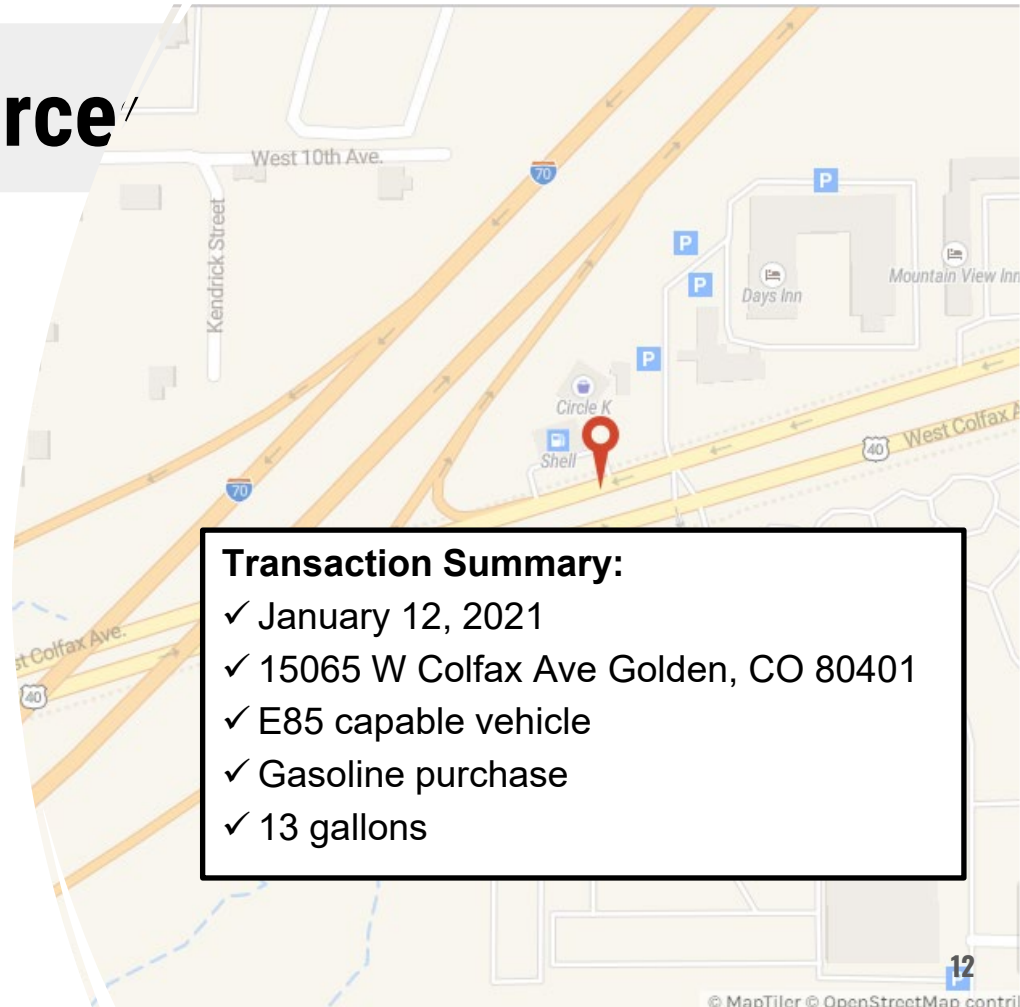
FleetDASH Administration

25 agencies have data in FleetDASH.

Primarily GSA leased vehicle data (3 agencies w/ agency-owned data).

Transaction and inventory data is loaded monthly.

Fleet hierarchies developed with agency leadership based on GSA BOAC codes.

Most agencies require approval from national fleet manager for account approval.

EPAct 2005 Section 701

EPAct 2005 Section 701:

"Dual-fueled vehicles … shall be operated on alternative fuels unless … qualifies for a waiver…"

FleetDASH **automates the waiver request requirement** for vehicles in FleetDASH.

Transactions beyond 3 miles of available alternative fuel are **waived.**

More on Section 701:

https://www.energy.gov/femp/federal-fleet-requirements-resource-center-epact-2005-section-701-alternative-fuel-use-dual

701 Attainment Tracking (FY 2023 to Date)

The Section 701 Attainment pie chart displays the percentage of time fleet dual-fueled ve
Comparison to Prior Fiscal Year chart shows the quantities of alternative fuel used and co
fiscal year compared to the same time last fiscal year.

FleetDASH 701 Attainment

35%

65%
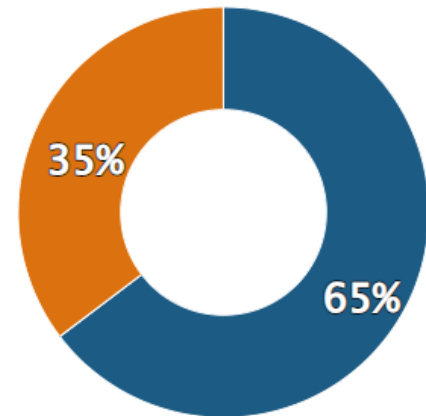
● FleetDASH 701 Attainment   ● Covered Missed Opportunities

14

PHEVs and Section 701

Plug-in hybrid electric vehicles (PHEVs) are covered dual-fueled vehicles under section 701.

- Assumed to have garage location charging available.

- Charging data is limited.

- FAST is the primary source for PHEV performance tracking.

ChargePoint RFID card for tracking charging at public stations:
- GSA Fleet Services Card at public charging stations

Vehicle Summary Table

Performance toward EPAct 2005 Section 701 goals are summarized for each of the fleet dual-fueled vehicles in the following table. Section 701 attainment represents the percentage of time dual-fueled vehicles operated on alternative fuel when the fuel was available. Clicking on a vehicle will take you to a vehicle summary page which includes details and transactions for the selected vehicle.

Download Vehicle Summary CSV

Vehicle Tag	Vehicle Fuel Type	701 Covered	Alternative Fuel (GGEs)	Missed Opportunity (GGEs)	701 Attainment (%)
	FFV	Covered	0	74	0
	PHEV	Covered	0	149	0
	FFV	Covered	0	56	0
	FFV	Covered	0	30	0
	PHEV	Covered	1	34	10
	FFV	Covered	0	25	0
	PHEV	Covered	0	24	0
	FFV	Covered	0	22	0
	FFV	Covered	0	21	0
	PHEV	Covered	1	66	4

15

FleetDASH AFV Screening Tool

| Section 701 | Fuel Use | Inventory | Greenhouse Gas | **AFV Screening** |

	Vehicles	**Available Replacements¹ Based on Vehicle Segment**							**Percent of GGEs² Near Alternative Fuel**			
		BEV	**PHEV**	**HEV**	**E85**	**B20**	**CNG**	**LPG**	**E85**	**B20**	**CNG**	**LPG**
Light-Duty	7,620	4,933	3,566	4,614	2,018	0	0	0	37%	1%	8%	1%
Medium and Heavy-Duty	5,050	2,590	0	0	4,449	5,047	601	79	28%	5%	7%	2%
Total	12,670	7,523	3,566	4,614	6,467	5,047	601	79	32%	3%	8%	2%

1. Vehicle availability determined by **fiscal year 2024** GSA alternative fuel vehicle guide.
2. Calculations based on **fiscal year 2023** totals.

How many vehicles have a ZEV replacement of the same vehicle segment?

Updated with FY23 fuel consumption and FY24 AFV availability.

FleetDASH AFV Screening Tool

Fiscal Year 2023 Light-Duty Vehicle Data					Estimated Petroleum GGEs Reduced*			
VIN	Tag	Vehicle Segment	Fuel Type	Total GGEs	BEV	PHEV	HEV	E85
	G10-1769W	Sedan/St Wgn Compact	GAS	802	802	615	342	N/A
	G12-0033X	Sedan/St Wgn Compact	GAS	779				
	G10-0965Y	Sedan/St Wgn Compact	GAS	766				
	G12-0099Y	Sedan/St Wgn Compact	GAS	760				

Estimated Annual Operating Cost Savings:

	> $500
	> $250
	> $0 - $250
	Added costs

What are the petroleum and cost saving opportunities for switching to a ZEV?
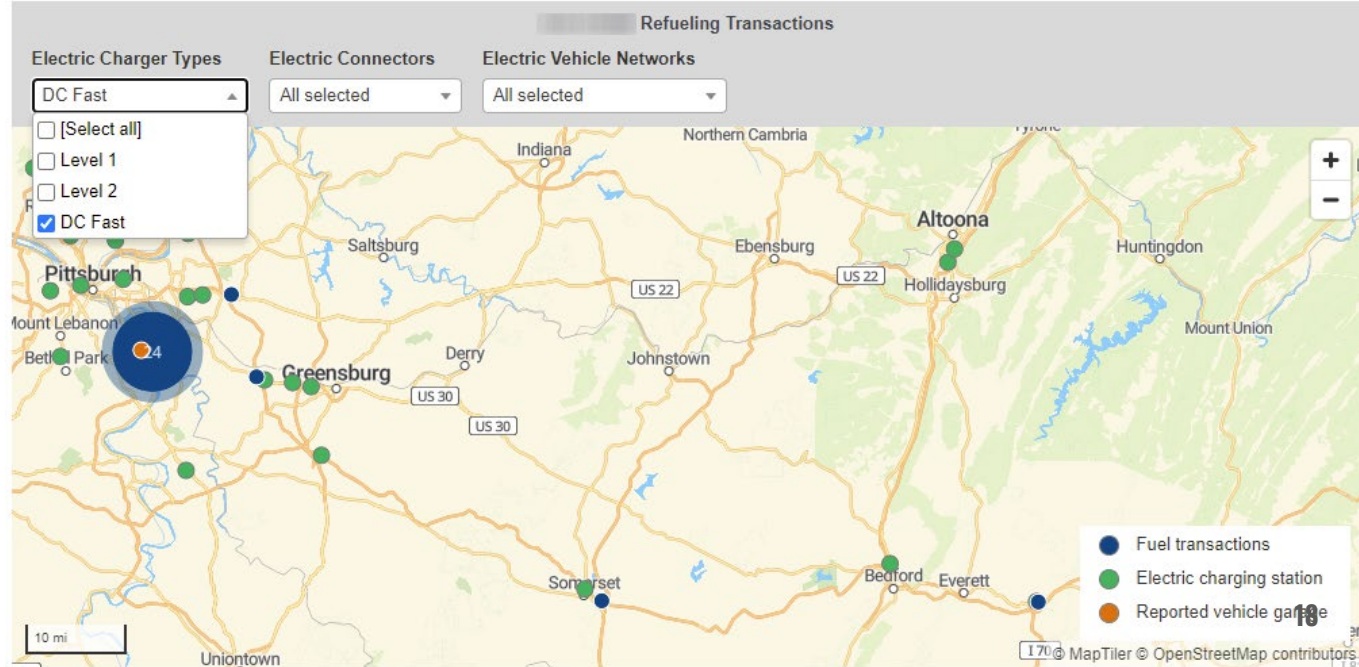
FleetDASH AFV Screening Tool

Are there public fast charging stations where the vehicle operates?

ZPAC Overview

Existing Vehicle			BEV Considerations						Decision Point
Vehicle	Site Name (Entry Necessary to relate to EVSE Needs & Prioritization Tab)	BEV SIN Availability	BEV Replacement SIN	Modeled BEV Range Concerns*	Reported BEV Range Concerns (Dropdown)	BEV GHG Emission Reduction Potential	Quality of BEV Candidate		ZEV Preference (Agency Entry from Dropdown)
VIN 6	GARAGE 1	1 - Identical BEV	9E	5 - Very Frequent Public Charging Likely	2 - Some Public Charging Likely	2 - High	2 - Good		BEV
VIN 7	GARAGE 1	3 - Consider PHEV	20P	5 - Very Frequent Public Charging Likely	1 - Minimal Public Charging Likely	2 - High	5 - Consider PHEV		PHEV
VIN 8	GARAGE 1	3 - Consider PHEV	20P	5 - Very Frequent Public Charg		2 - High	5 - Consider PHEV		PHEV
VIN 9	GARAGE 1			Frequent Public Charging Likely			PHEV		PHEV
VIN 10	GARAGE 1			Frequent Public Charging Likely			PHEV		PHEV
VIN 11	GARAGE 1			Minimal Public Charging Likely	5 - Very Frequent Public C		Option		Other
VIN 16	Parking Lot XYZ			Minimal Public Charging Likely			cre		BEV
VIN 17	Parking Lot XYZ			Minimal Public Charging Likely			cre		BEV

Site Information				Level 2				Charging Acces		Facility POC Email	Comments
Agency	Site Name	Cen (ZIP			Number of Level 2 s at Site	Input Suitabi	Site				
Federal Agency	GARAGE 1	FA: LO			5						
Federal Agency	Parking Lot XYZ	Unknown	ZIP 8		0	15					
Federal Agency	Parking ABC	FA: LOCATION 15	ZIP 9	843		5					
Federal Agency	Pool Location 1	Unknown	ZIP 10	0		6					

Identify ZEV Opportunities:

Which vehicles to electrify?
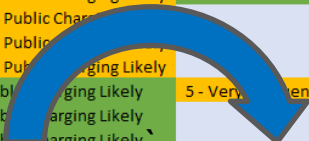
Site EVSE Plan:

How many EVSE of what type?
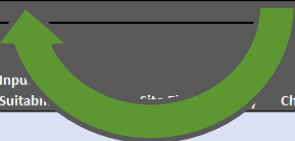
ZPAC is an <u>optional</u> tool.

Email **mark.singer@nrel.gov** for your FY 23 fleet-specific copy.
FY 24 ZPAC is planned to be available in late April 2024.

ZPAC Inputs and Overview

Provides a holistic **framework for targeting ZEVs and EVSE.**

Annual FAST submission provides your agency's **complete inventory.**

FleetDASH provides additional attributes, **analysis**, and **mapping capability.**

GSA AFV guide provides **ZEV vehicle type availability.**

User-provided vehicle locations are based on available inventory fields.

Supports **ZEV Strategic Plans** and **Quarterly EVSE Deployment** reporting**.**

Goals for Planned FY 24 ZPAC Update

Simplify user steps and provide defaults where possible.

Remove the need for any macros.

Support multi-year summary outputs.

Align outputs with E.O. 14057 ZEV Strategic Plans

ZPAC Process

Step 1: Define Fleet Site Locations

Step 2: Evaluate Vehicles and Plan ZEV Acquisitions

Step 3: Evaluate EVSE Needs for ZEV Acquisitions

Step 4: Evaluate High Level Plan

Identify ZEV Sites

Fleets begin by identifying specific parking locations where ZEVs will be parked and require charging infrastructure.

CONCEPT DEVELOPMENT

Step 1. Identify Site Locations for ZEV Evaluation and EVSE Installation						
Site Number	INPUT 1. REQUIRED Define Site Names	Address 1	City	State	Zip	Parking Lot Real Property ID
1	SITE 1					
2	SITE 2					
3	SITE 3					
4	SITE 4					

Which vehicles to electrify?

Fleets review vehicle evaluation and determine which vehicles will be planned for ZEV replacement and estimate a replacement year.

CONCEPT DEVELOPMENT

BEV Considerations						Decision Point	
BEV SIN Availability	Modeled BEV Range Concerns*	Reported BEV Range Concerns (Dropdown)	BEV GHG Emission Reduction Potential	Quality of BEV Candidate		ZEV Preference	Plan Year of Acquisition
2 - Similar BEV	3 - Unknown		1 - Very High	2 - Good		BEV	2024
2 - Similar BEV	2 - Some Public Charging		1 - Very High	2 - Good		BEV	2025
	Minim			2 - Good		Pl	
	Minim Likely			2 - Good		B	
2 - Similar BEV	4 - Frequent Public Charging Likely		1 - Very High	3 - Mediocre		E	
2 - Similar BEV	5 - Very Frequent Public Charging Likely		1 - Very High	4 - Challenging		Eliminate	2025

ZEV replacement available?

Nightly charging sufficient? Limit mission disruption

Fuel, cost, and emissions benefits?

User Identifies ZEV Targets

How many ports of what type?

ZEV plans are summarized by defined sites to support evaluation of charging port requirements.

Priority	Site Information			BEVs - Level 2 Charging Ports		PHEVs - Level 1 Charging Ports	
Priority EVSE Deployment	Agency	Site Name	ZIP	Existing Level 2 Ports at Site	Planned Additional Level 2 Ports at Site	Existing Level 1 Ports at Site	Planned Additional Level 1 Ports at Site
Yes	Federal Agency	Site 1	ZIP 1	2	12	1	1

Vehicle Location Summary

Size EVSE for specific locations and ZEV targets

Evaluate Summary Plan

How will annual acquisition decisions affect E.O. goal attainment?

How will ZEV fleet grow in near and long term?

1. Planned Vehicle Acquisitions - SITE 1

CONCEPT DEVELOPMENT

2. Planned Vehicle Inventory - SITE 1

CONCEPT DEVELOPMENT

26
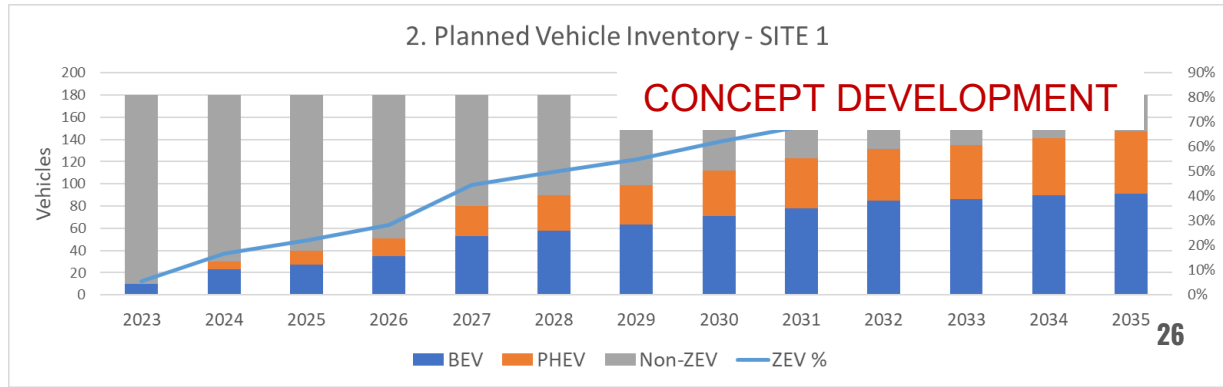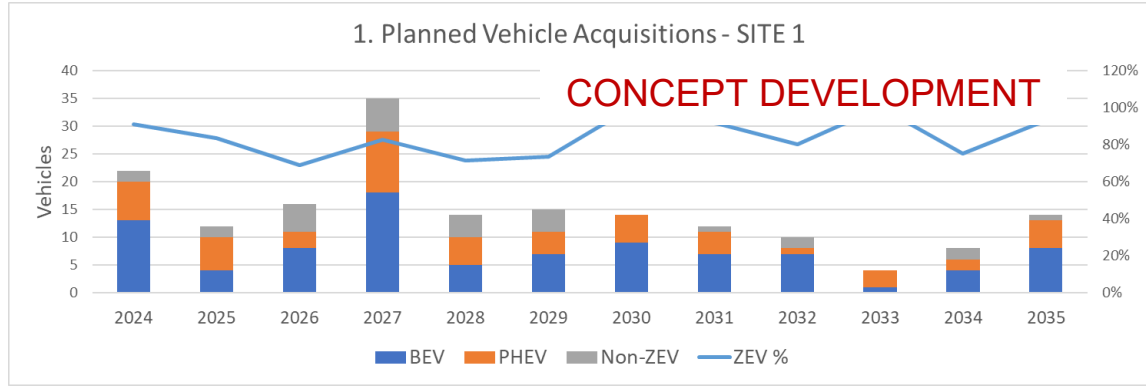
Evaluate Summary Plan

Track progress of electrification plans.

Will port plans align with ZEV acquisition goals?

ZEV and EVSE Site Plan (20 Vehicles)

CONCEPT DEVELOPMENT

Chart: ZEVs & EVSE Ports (y-axis, 0–20) vs. years 2023–2030.

Legend:
- Existing L2 (solid green)
- Planned L2 Additions (hatched green)
- Existing ZEVs (solid blue)
- Planned Additional ZEVs (hatched blue)
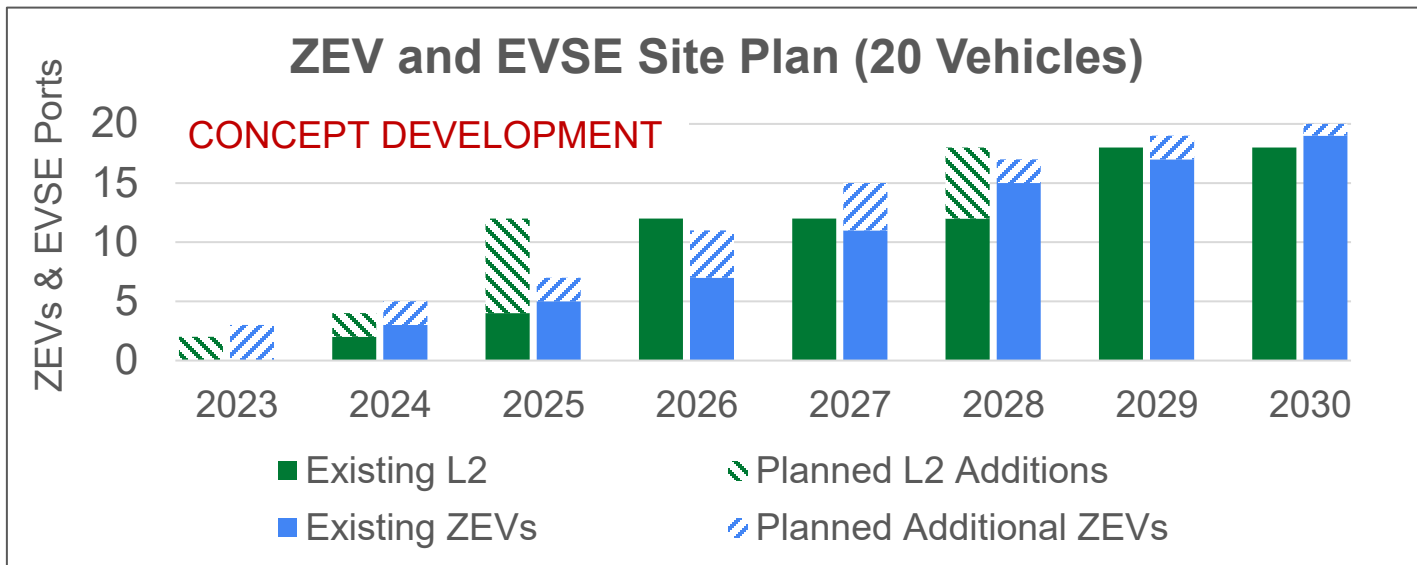
Goals for Planned FY 24 FleetDASH Update

Align FleetDASH with ZPAC ZEV evaluation framework.

Identify top opportunities for ZEV replacement.

Track growth in fleet ZEV inventory.

Support ZEV charging behavior tracking.

Continue to provide fleet drilldown capability to individual vehicles.
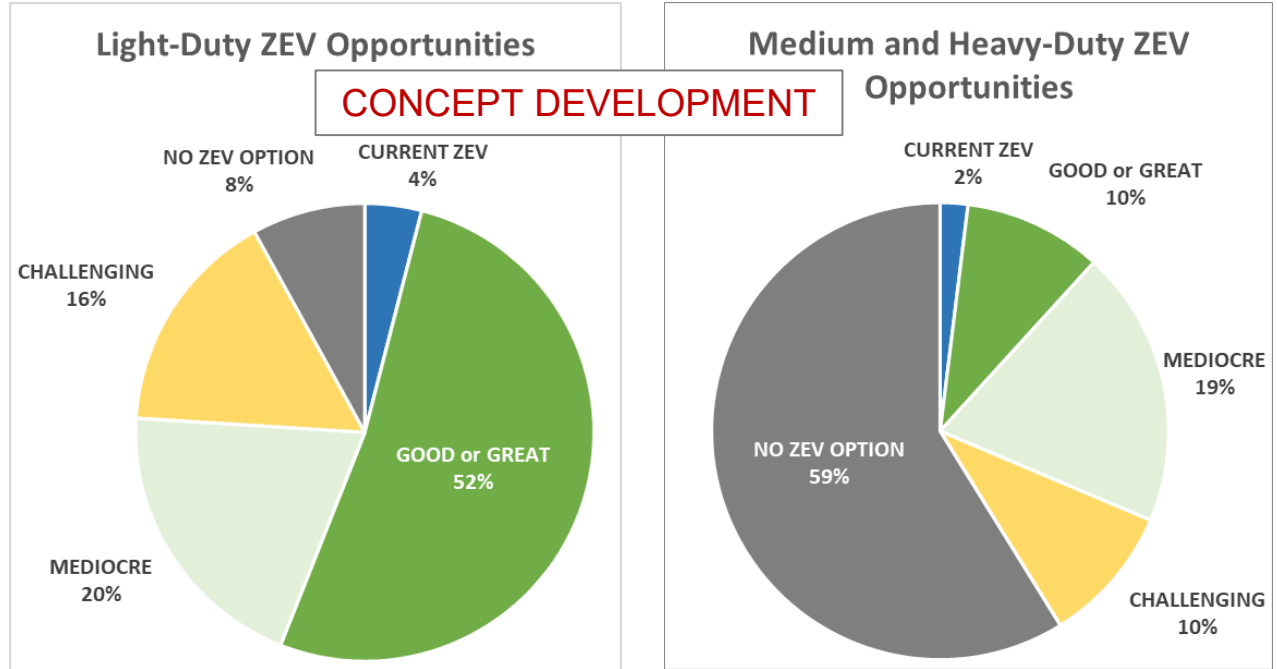
FY 24 Planned FleetDASH Updates

Align FleetDASH with ZPAC ZEV evaluation framework.

CONCEPT DEVELOPMENT

VIN	Vehicle Weight Class	Vehicle Type	Previous 12 months GGEs	GHG Emission Reduction Potential	BEV Availability	Estimated Days Above 250 Miles?	% Near Public Fast Charging?	Quality of ZEV Candidate
XXXXXXX1	LD	Sedan/St Wgn Compact	3,000	Very High	Identical BEV	2	10%	GREAT
XXXXXXX2	LD	LD Minivan 4x2	300	Moderate	Consider PHEV	1	75%	GREAT
XXXXXXX3	LD	LD SUV 4x4	2,000	Very High	Identical BEV	15	40%	MEDIOCRE
XXXXXXX4	LD	LD SUV 4x4	700	High	Identical BEV	5	20%	GREAT
XXXXXXX5	MD	MD Pickup	2,500	Very High	Similar BEV	25	10%	CHALLENGING
XXXXXXX6	MD	MD Pickup	250	Moderate	Similar BEV	2	10%	GREAT
XXXXXXX7	HD	HD Bus	4,000	Very High	Similar BEV	30	40%	CHALLENGING

FY 24 Planned FleetDASH Updates

Track growth in ZEV inventory and identify challenging vehicles to electrify.

Light-Duty ZEV Opportunities

CONCEPT DEVELOPMENT

- NO ZEV OPTION 8%
- CURRENT ZEV 4%
- CHALLENGING 16%
- GOOD or GREAT 52%
- MEDIOCRE 20%

Medium and Heavy-Duty ZEV Opportunities

- CURRENT ZEV 2%
- GOOD or GREAT 10%
- MEDIOCRE 19%
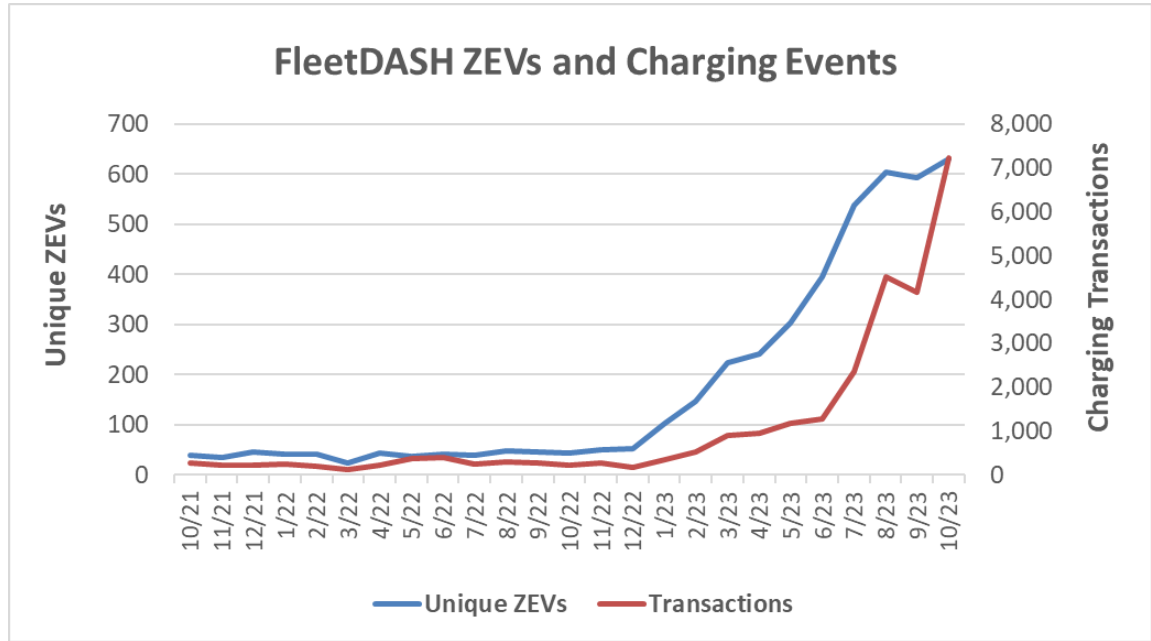- NO ZEV OPTION 59%
- CHALLENGING 10%

FY 24 Planned FleetDASH Updates

ZEV charging at public stations began to appear in FleetDASH in 2023.

Continue to include charging data as it is available.

Develop views highlighting ZEV charging and DCFC station growth.

FleetDASH ZEVs and Charging Events

Thank you!

Mark Singer, NREL