Federal Fleet Requirements and Real-World Examples

Julian Bentley, Bentley Energy Consulting
Ted Sears, National Renewable Energy Laboratory
Agenda

Federal Fleet Requirements and Goals

Federal Fleet Performance and Trends

FY17 FAST Vehicle-Level Data Entry Recap

Fleet Sustainability Strategies

Implementation: Example Fleet
Mission: Assist Federal agencies with meeting or exceeding requirements for reducing fleet GHG emissions

• Understanding and meeting Federal requirements
  – Guidance
  – Handbook
  – FAST system maintenance, upgrades, and training

• Technical assistance, analysis, and tools
  – Fuel consumption dashboard (FleetDASH)
  – Geographic analysis of fleet fueling patterns, for facilitating development of new alternative fuel infrastructure

• Education and communication
  – Federalfleets.energy.gov
  – INTERFUEL working group
Federal Fleet Requirements: Overview

The overarching Federal fleet goal is to increase efficiency

Efficiency is currently expressed by GHG/mile

---

**Improve Fleet Efficiency**

**Reduce Fleet-wide Per Mile GHG Emissions**

- **Create Agency Strategic Plan**
  - E.O. 13693

- **Establish VAM to Right-size Fleets**
  - E.O. 13693

- **Increase Fleet Fuel Efficiency**

- **Acquire AFVs and Use Alternative Fuel**
  - E.O. 13693

- **Acquire ZEVs and PHEVs**
  - EISA Sec. 141

- **Acquire Low Emitting GHG Vehicles**
  - E.O. 13693

- **Deploy Telematics and Manage Asset-Level Data**
  - E.O. 13693

---

- **Acquire AFVs**
  - EPAct 1992

- **Use Alternative Fuel in AFVs**
  - EPAct 2005 Sec. 701

- **Install Renewable Fuel Pumps**
  - EISA Sec. 246
# Federal Fleet Requirements

<table>
<thead>
<tr>
<th>Fleet Requirement</th>
<th>Statute or Executive Order</th>
<th>Description</th>
</tr>
</thead>
</table>
| Reduce per Mile GHG emissions             | E.O. 13693 Sec. 3(g)(ii)   | • 4% reduction by FY17  
• 15% by FY21  
• 30% by FY25 |
| Reduce overall GHG emissions              | E.O. 13693 Sec. 2          | Reduce fleet GHG emissions as part of agency-established reduction target for FY 2008 to FY 2025 |
| Optimum fleet inventory, right-size fleets| E.O. 13693 Sec. 3(g)(iv)   | Establish a structured VAM to determine the appropriate size and number of motor vehicles |
| Acquisition of ZEVs and PHEVs             | E.O. 13693 Sec. 3(g)(v)    | • 20% of new passenger vehicle acquisitions by FY20  
• 50% of new passenger vehicle acquisitions by FY25 |
| Acquisition of AFVs                      | EPAct 1992                 | At least 75 percent of LDVs acquired in MSAs/CMSAs must be AFVs |
| Acquisition of low GHG-emitting vehicles  | EISA § 141                 | Prohibits agencies from acquiring vehicles that are not low-GHG-emitting vehicles |
| Alternative fuel use in AFVs              | EPAct 2005 § 701           | All dual-fueled vehicles must use alternative fuel if reasonably available (i.e., unless waivered) |
| Alternative fuel infrastructure           | EISA § 246                 | Every federal fleet fueling center must install a renewable fuel pump |
E.O. 13693 Requirement:
Per Mile GHG Emission Reduction Targets

2017 Requirement: 4% reduction in FY17

Example with baseline of 500 g CO$_2$e/mile
Right-sizing Fleets and Vehicles

E.O.13693 Vehicle Allocation Methodology requirement

- Survey required every five years
- Agencies choose the most fuel-efficient vehicle for their operational needs
- Examine low-use vehicles for replacement in fleet
- EPAct covered petroleum consumption has fallen by 26 million GGEs annually since 2011 Presidential Memorandum (excluding USPS)
  - Net fuel expenditures dropped $890 million in that time period

Connection to other requirements

- **EISA §141**: Fuel efficient vehicles tend to be low-GHG emitting vehicles
- **E.O. 13693 ZEV and PHEV acquisition**: PEVs often have fuel efficiency ratings above 100 MPGe
- **VAM process considers AFV requirements and preference**
Acquire AFVs

AFV acquisition requirements

- **EPAct 1992**: Ensure that 75% of light duty vehicle acquisitions in metropolitan statistical areas (MSAs) are AFVs. (AFVs acquired outside of MSAs and biodiesel use counts towards meeting requirements)
- **E.O. 13693**: ZEVs (including BEVs) and PHEVs account for 20% of new passenger vehicle acquisitions by end of FY2020; 50% by end of FY2025
- **EISA 2007, Section 141**: LDVs and passenger MDVs must be low GHG emitting vehicles (exceptions permitted). Low GHG emitting vehicles meet AFV definition in locations without access to alternative fuel

Agency best practices

- Acquire AFVs in areas where alternative fuel is/will become available
- Focus HEV, PHEV, and BEV acquisitions where alternative fuel is not available
- Consider LSEVs, low GHG emitting vehicles (in locations without access to alternative fuel) and other high efficiency vehicles
Use Alternative Fuels

EPAct 2005, Section 701 requirement

- Dual-fueled vehicles (such as E85 FFVs) must use alternative fuel where reasonably available and not unreasonably more expensive than gasoline
- Agencies granted **waivers** based on lack of accessible station within 5 miles and 15 minutes driving of garage location

Tools: FleetDASH

- Analyzes transactions for opportunities to use alternative fuel within 5 miles

Connection to other requirements

- Acquiring AFVs and not using alternative fuel would be problematic
- Alternative fuels have lower GHG emissions per mile
Install Renewable Fuel Pumps

EISA 2007, Section 246 requirement

- Install renewable fuel pumps at federal fleet fueling centers
- Federal fleet fueling centers defined as >100,000 gallons of a single fuel with a federal fleet of 20+ EPAct-covered vehicles in an MSA
- Renewable fuels include E85, biodiesel, renewable electricity, or renewable hydrogen

Connection to other requirements

- **EPAct 1992**: Acquire AFVs in locations where alternative fuel pumps installed
- **EPAct 2005, §701**: Use alternative fuel in dual-fueled AFVs where reasonably available
- **EISA §141**: Biodiesel as alternative compliance measure
Core Principles

“Core Principles” help fleets reduce:
- Operational costs by lowering petroleum use
- Vehicle asset costs by right-sizing fleets and vehicles to mission

Right-size fleets & vehicles to mission
- Identify & dispose of inefficient vehicles
- Replace them with more fuel efficient vehicles
- Optimize/reduce fleet vehicle miles travelled

Replacing existing vehicles with higher fuel economy vehicles
- Identify most fuel efficient vehicle for the mission
- Cost effective HEVs, PHEVs, and LSEVs

Cost effective operational changes
- Improved maintenance
- Drive more efficiently
- Avoid Idling

Maximize displacement of conventional fuels with domestic alternative fuels
- E85, CNG, B20 AFVs and infrastructure support
- Electric vehicles and charging stations
Agenda

Federal Fleet Requirements and Goals

Federal Fleet Performance and Trends

FY17 FAST Vehicle-Level Data Entry Recap

Fleet Sustainability Strategies

Implementation: Example Fleet
### FY 2016 Federal Fleet Compliance Summary

<table>
<thead>
<tr>
<th>Requirement</th>
<th>FY 16 Performance</th>
</tr>
</thead>
</table>
| **EO 13693**  
*Per-mile GHG Emissions* | Reduce fleet-wide per-mile GHG emissions by 2% relative to FY 2014 baseline (for FY16) | **1.1 percent**  
25 of 32 covered agencies achieved compliance |
| **EPA Act 92 AFV Acquisitions** | 75% of “covered” light-duty vehicle (LDV) acquisitions must be AFVs | **203 percent**  
29 of 31 covered agencies achieved compliance |
| **EPA Act 2005 §701**  
*Alternative Fuel Use in AFVs* | All dual-fueled AFVs must use alternative fuel if available (i.e., unless waived) | **90 GGE** of alternative fuel use per non-waivered dual-fuel AFV |

FY 2017 FAST reporting is not yet finalized.
Federal fleets have consistently exceeded EPAct 1992 AFV acquisition requirements
Transformation from Conventional Vehicles to AFVs

- **E85 FFVs**: 14% → 33%
- **Hybrid**: 0% → 4%
- **Diesel**: 11% → 11%
- **Gasoline**: 73% → 52%
Use of Alternative Fuels

E85 comprises majority of Federal fleet alternative fuel use increase
Federal fleets have steadily increased the number of dual-fueled AFVs subject to EPAct 2005 §701…

… but the alternative fuel use per non-waivered AFV has been decreasing since FY12
Agenda

Federal Fleet Requirements and Goals

Federal Fleet Performance and Trends

FY17 FAST Vehicle-Level Data Entry Recap

Fleet Sustainability Strategies

Implementation: Example Fleet
Quality Review: Summary of Potential VLD Data Issues

<table>
<thead>
<tr>
<th>Potential Issue</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Fuel Type Mismatch</strong></td>
<td>9.9%</td>
</tr>
<tr>
<td>Fuel type inconsistent with reported vehicle fuel type</td>
<td></td>
</tr>
<tr>
<td><strong>2 Low Miles per Vehicle</strong></td>
<td>9.6%</td>
</tr>
<tr>
<td>Low vehicle usage (typically less than 2,000 miles per year)</td>
<td></td>
</tr>
<tr>
<td><strong>3 High MPG</strong></td>
<td>5.0%</td>
</tr>
<tr>
<td>Calculated MPG far exceeds model or class averages</td>
<td></td>
</tr>
<tr>
<td><strong>4 Minimal Vehicle Utilization</strong></td>
<td>3.4%</td>
</tr>
<tr>
<td>Very low or zero mileage and fuel use</td>
<td></td>
</tr>
<tr>
<td><strong>5 Low MPG</strong></td>
<td>3.4%</td>
</tr>
<tr>
<td>Calculated MPG far below model or class averages</td>
<td></td>
</tr>
<tr>
<td><strong>6 High Miles per Vehicle</strong></td>
<td>0.7%</td>
</tr>
<tr>
<td>High vehicle usage (typically more than 30,000 miles per year)</td>
<td></td>
</tr>
<tr>
<td><strong>7 No Electricity Reported for EV</strong></td>
<td>0.02%</td>
</tr>
<tr>
<td>Reported no electricity for a PHEV or BEV</td>
<td></td>
</tr>
</tbody>
</table>

No Issue 76%

Issue 24%
## Possible Causes/Solutions for VLD Data Issues

### Issues Impacting Data Quality

<table>
<thead>
<tr>
<th>Fuel coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fleet cards data systems (GSA Drive-thru and others) capture fuel codes reported by fuel station</td>
</tr>
<tr>
<td>• Fuel codes often inconsistent with actual fuel use, especially at alternative fuel stations</td>
</tr>
<tr>
<td>• Vehicle fuel type errors in fleet management system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure <strong>vehicle</strong> fuel types are entered correctly in fleet management systems</td>
</tr>
<tr>
<td>• <strong>Correct raw fuel data</strong> after upload; create process for correcting alternative fuel data</td>
</tr>
<tr>
<td>• Fleet card management controls</td>
</tr>
</tbody>
</table>

### Mileage data collection and entry

<table>
<thead>
<tr>
<th>Mileage data collection and entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Errors in mileage data entry at pumps</td>
</tr>
<tr>
<td>• Timeliness and process for mileage data collection (manual data entry)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Create processes to ensure mileage data quality</td>
</tr>
<tr>
<td>• <strong>Identify data issues and correct</strong>, with support from field</td>
</tr>
</tbody>
</table>

### Electricity reporting

<table>
<thead>
<tr>
<th>Electricity reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data systems not capturing electricity use by PHEVs and BEVs</td>
</tr>
<tr>
<td>• Charging stations without data collection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identify PHEVs and BEVs in fleet management system and review fuel reporting</td>
</tr>
<tr>
<td>• Estimate electricity use if data if not available</td>
</tr>
</tbody>
</table>

### Vehicle Utilization Issues

<table>
<thead>
<tr>
<th>Vehicle Utilization Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vehicles with minimal use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perform VAM to identify under-utilized vehicles</td>
</tr>
</tbody>
</table>
February INTERFUEL: VLD Data Entry Recap

- Open discussion of FY17 VLD data effort, fleet data management issues, and opportunities for improvement
- Brainstorm on how the VLD data entry process can be improved for FY18
- Share suggestions with DOE FEMP, GSA, and INL FAST team

9:00am on Wednesday, February 14
Attend in person at NREL conference room, or by phone
Agenda

Federal Fleet Requirements and Goals
Federal Fleet Performance and Trends
FY17 FAST Vehicle-Level Data Entry Recap
Fleet Sustainability Strategies
Implementation: Example Fleet
**Principle 1: Right-size fleets to mission**

**Requirement: VAM study and reports**

<table>
<thead>
<tr>
<th>Generate a fleet profile</th>
<th>Develop minimum utilization criteria</th>
<th>Compare existing fleet to actual mission requirements</th>
<th>Develop acquisition plan</th>
<th>Review and Update VAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilization study, vehicle inventory and mission requirements</td>
<td>Validate vehicle need based on mission needs, define baseline of required fleet</td>
<td>Dispose or reassign vehicles as needed</td>
<td>Create a multi-year acquisition plan, recommend vehicle type and size by location, and place AFVs where fuel is available</td>
<td>Update VAM at least every five years (VAM reports)</td>
</tr>
</tbody>
</table>

- **Generate a fleet profile**
  - Develop minimum utilization criteria
- **Utilization study**, vehicle inventory and mission requirements
  - Validate vehicle need based on mission needs, define baseline of required fleet
- **Compare existing fleet to actual mission requirements**
  - Dispose or reassign vehicles as needed
- **Develop acquisition plan**
  - Evaluate alternatives where possible
- **Review and Update VAM**
  - Create a multi-year acquisition plan, recommend vehicle type and size by location, and place AFVs where fuel is available

- **Right-size fleets and vehicles to mission**
  - Increase fleet fuel efficiency
  - Use alternative fuels, including electricity

---

**U.S. DEPARTMENT OF ENERGY**  **OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY**
Reduce Vehicle Miles Travelled

Low /No-Cost Solutions for All Vehicle Types

• Consolidate trips
  – Eliminate trip duplication
  – Car pooling

• Eliminate trips
  – Video and Web conferencing tools
  – Transportation on demand (TOD)

• Improve scheduling and routing
  – Optimize travel distance using GPS technology

• Use mass transportation
  – Use mass transportation alternatives to eliminate fleet vehicle transportation needs

• Use agency shuttles
  – Provide a shuttle service for high-use routes to consolidate trips
Opportunities to Pool Vehicles

Pooling vehicles provides opportunities to eliminate fleet vehicles and reduce costs

- Federal fleet annual average of 6,835 miles per vehicle is much lower than the national average of 11,700 miles
- Low miles per vehicle suggest some opportunities to create vehicle pools

![Bar chart showing vehicle miles per year comparison across different vehicle types and years (2014, 2015, 2016)].
Principle 2: Increase Fleet Fuel Efficiency

• Acquire higher fuel economy vehicles
  – Downsize vehicles
  – Use VAM to determine the optimal types based on mission need

• Acquire hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs)
  – Can reduce petroleum and GHG emissions by 30% or more
  – Focus deployment of HEVs in areas lacking access to alternative fuel

• Maintain vehicles to improve fuel economy
  – Perform regularly scheduled and preventative maintenance

• Drive more efficiently
  – Use cruise control, avoid fast starts, remove excess weight, etc.

• Avoid excessive idling
  – Turn off engines when vehicles are stopped or parked
  – Use idling reduction technologies for essential heating, cooling, and other auxiliary loads (e.g., APUs)
### Example vehicle per-mile GHG emissions

<table>
<thead>
<tr>
<th>Category</th>
<th>Vehicle Model</th>
<th>2012/2017</th>
<th>2012/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact sedan</td>
<td>Ford Focus</td>
<td>287 g/mile</td>
<td>289 g/mile</td>
</tr>
<tr>
<td></td>
<td>Ford C-MAX Hybrid</td>
<td>222 g/mile</td>
<td></td>
</tr>
<tr>
<td>Midsize sedan</td>
<td>Chevy Malibu</td>
<td>342 g/mile</td>
<td>342 g/mile</td>
</tr>
<tr>
<td></td>
<td>Ford Fusion Hybrid</td>
<td>228 g/mile</td>
<td>210 g/mile</td>
</tr>
<tr>
<td>Large sedan</td>
<td>Ford Taurus</td>
<td>423 g/mile</td>
<td>362 g/mile</td>
</tr>
<tr>
<td></td>
<td>Toyota Avalon Hybrid</td>
<td>223 g/mile</td>
<td></td>
</tr>
<tr>
<td>Passenger Van</td>
<td>Chevrolet Express 2500 8-cyl.</td>
<td>684 g/mile</td>
<td>704 g/mile</td>
</tr>
<tr>
<td>Minivan</td>
<td>Chrysler Town &amp; Country/Pacifica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small SUV</td>
<td>Ford Escape</td>
<td>386 g/mile</td>
<td>369 g/mile</td>
</tr>
<tr>
<td>Large SUV</td>
<td>Chevy Tahoe 1500 4x4</td>
<td>523 g/mile</td>
<td>497 g/mile</td>
</tr>
<tr>
<td>Light-duty Truck 4x2</td>
<td>Ford F150</td>
<td>468 g/mile</td>
<td>426 g/mile</td>
</tr>
<tr>
<td>Light-duty Truck 4x4</td>
<td>Chevrolet Silverado K15 4WD</td>
<td>555 g/mile</td>
<td>473 g/mile</td>
</tr>
</tbody>
</table>

Source: fueleconomy.gov
Increase Vehicle Fuel Efficiency

Focus on increasing the fuel efficiency of the least efficient vehicles

Federal fleet average:
12 mpg
Principle 3: Use Alternative Fuels

Alternative fuels include but are not limited to:

- Electricity
- E85
- Compressed natural gas (CNG)
- Liquefied natural gas (LNG)
- Liquefied petroleum gas or propane (LPG)
- Neat (100%) biodiesel (B100) or biodiesel blends

Dual-fueled AFVs **MUST** use alternative fuel if available (*EPA*Act 2005, Section 701):

- E85 FFVs,
- Bi-fuel CNG or LNG vehicles, and
- Bi-fuel LPG vehicles
Alternative Fuels – GHG emission reductions

<table>
<thead>
<tr>
<th>Fuel</th>
<th>kg CO₂e/GGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>9.0</td>
</tr>
<tr>
<td>Gas</td>
<td>8.0</td>
</tr>
<tr>
<td>LPG</td>
<td>7.0</td>
</tr>
<tr>
<td>B20</td>
<td>6.0</td>
</tr>
<tr>
<td>CNG</td>
<td>5.0</td>
</tr>
<tr>
<td>LNG</td>
<td>4.0</td>
</tr>
<tr>
<td>HEV</td>
<td>3.0</td>
</tr>
<tr>
<td>E85</td>
<td>2.0</td>
</tr>
<tr>
<td>PHEV</td>
<td>1.0</td>
</tr>
<tr>
<td>B100</td>
<td>1.0</td>
</tr>
<tr>
<td>BEV</td>
<td>1.0</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>0.0</td>
</tr>
</tbody>
</table>

100% Reduction
Strategies to Increase Alternative Fuel Use

EPAct 2005 §701: FY 2016 estimate of 90 GGE of alternative fuel use per non-waivered dual-fuel AFV

- **FLEETDASH**: Monitor fuel transaction data
- **Lock-out dual-fueled AFVs** from using gasoline pumps
- **Provide locations** and driving directions to alternative fuel stations
  - Tools available at AFDC (www.afdc.energy.gov)
- **Policies and training for local fleet managers** and drivers
- **Consider alternative fuel use metrics in performance reviews and job descriptions**

![Map of Alternative Fuel Stations](image)
Agenda

Federal Fleet Requirements and Goals
Federal Fleet Performance and Trends
FY17 FAST Vehicle-Level Data Entry Recap
Fleet Sustainability Strategies
Implementation: Example Fleet
Goal: Cost-effectively reduce fleet per-mile GHG emissions (increase fleet efficiency) through the appropriate combination of the three core principles.

- Evaluate strategies and tactics for each fleet location
- Assess site-specific characteristics, including:
  - Fleet mission tasks
  - Fleet size and vehicle composition
  - Fleet utilization (operating characteristics)
  - Availability of alternative fuel (public and private)
**Example Fleet: Site Characteristics**

**Fleet Location G**
- Located approximately 5 miles east of Archdale, NC
- 70 square miles
- Combined 1,117,140 GGE fuel use in FY 2016
  - *Covered Petroleum*: 1,004,569 GGE
  - *Alternative Fuel*: 84,199 GGE
- 1,580 fleet vehicles
Example Fleet: *Fleet Operations*

- Most vehicles are garaged in both the east and west of site
- Many MD and HD vehicles operate in central area
- Vehicle tasks
  - transportation between the two locations
  - trips between
  - security operations
  - hauling of trailers
  - service truck operations
- Fleet operations expected to grow, including off-road capable vehicles and pickup trucks
## Example Fleet: Fleet Composition

### Vehicles by Type and Fuel Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Gasoline</th>
<th>E85 FFV</th>
<th>HEV</th>
<th>PHEV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Midsize Sedans (225)</strong></td>
<td>95</td>
<td>97</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>LD Pickup (220)</strong></td>
<td>117</td>
<td>103</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LD SUV (204)</strong></td>
<td>120</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LD Minivan (194)</strong></td>
<td>60</td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compact Sedans (180)</strong></td>
<td>86</td>
<td>91</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Total Vehicles by Fuel Type

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>LD Vehicles</th>
<th>MD Vehicles</th>
<th>HD Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gasoline:</strong></td>
<td>478</td>
<td>188</td>
<td>8</td>
</tr>
<tr>
<td><strong>E85 FFV:</strong></td>
<td>509</td>
<td>54</td>
<td>241</td>
</tr>
<tr>
<td><strong>HEV:</strong></td>
<td>33</td>
<td><strong>66</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PHEV:</strong></td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Example Fleet Composition

- **# Vehicles**
  - LD: 1,023
  - MD: 308
  - HD: 249

- **Vehicles by Type and Fuel Type**
  - **LD Vehicles**
    - Midsize Sedans (225)
    - LD Pickup (220)
    - LD SUV (204)
    - LD Minivan (194)
    - Compact Sedans (180)
  - **MD Vehicles**
    - MD Pickup (215)
    - MD Van (48)
    - MD SUV (35)
  - **HD Vehicles**
    - HD Other (239)
    - HD Bus (10)

- **Total Vehicles by Fuel Type**
  - **Gasoline:**
    - LD: 478
    - MD: 188
    - HD: 8
  - **E85 FFV:**
    - LD: 509
    - MD: 66
    - HD: 241
  - **Diesel:**
    - LD: 54
    - MD: 54
    - HD: 241
  - **HEV:**
    - LD: 33
    - MD: 33
    - HD: 3
  - **PHEV:**
    - LD: 3
    - MD: 3
    - HD: 3
## FY 2016 Fleet Fuel Use (GGE)

<table>
<thead>
<tr>
<th></th>
<th>Gasoline</th>
<th>E85</th>
<th>Diesel</th>
<th>B20</th>
<th>ELE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD Vehicles</td>
<td>512,500</td>
<td>49,200</td>
<td>-</td>
<td>-</td>
<td>790</td>
<td>562,490</td>
</tr>
<tr>
<td>MD Vehicles</td>
<td>146,600</td>
<td>5,700</td>
<td>47,400</td>
<td>-</td>
<td>-</td>
<td>199,700</td>
</tr>
<tr>
<td>HD Vehicles</td>
<td>9,400</td>
<td>-</td>
<td>345,550</td>
<td>-</td>
<td>-</td>
<td>354,950</td>
</tr>
<tr>
<td>TOTAL</td>
<td>668,500</td>
<td>54,900</td>
<td>392,950</td>
<td>-</td>
<td>790</td>
<td>1,117,140</td>
</tr>
</tbody>
</table>

### Maps
- **West Site Location**
- **East Site Location**
- **Gasoline Refueling Station**
- **Local E85 Station (Sheetz) 2 miles from East Site**
- **EVSE**
- **Diesel Refueling Station**

**U.S. DEPARTMENT OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY**
Principle 1: Right-size fleets to mission
Vehicle Utilization

# of Vehicles

- Compact Sedans
- Midsize Sedans
- LD Pickup
- LD Minivan
- MD Pickup
- MD Van
- MD SUV
- Ambulance
- HD Other
- HD Bus

<table>
<thead>
<tr>
<th># of Vehicles</th>
<th>180</th>
<th>225</th>
<th>220</th>
<th>204</th>
<th>194</th>
<th>215</th>
<th>48</th>
<th>35</th>
<th>10</th>
<th>239</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles per Vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Opportunities to Increase Fleet Efficiency

## Issues limiting fleet efficiency

### Fleet Vehicle Composition
- Number of light-duty gasoline only vehicles
- Number of medium-duty gasoline only vehicles
- Underutilization of fleet vehicles (miles per vehicle)

### Vehicle Fuel Efficiency
- High per-mile GHG emissions
- Inefficient MD and HD vehicles

### AF Infrastructure Limitations
- No E85 infrastructure access near the West site
- No local B20 availability

### AF Utilization Issues
- Low utilization of E85 (23%)

## Recommendations

1. Establish shuttle routes between East and West Sites
2. Complete VAM study to determine optimal fleet composition
3. Evaluate opportunities to create fleet vehicle pools at East and West Sites
4. Maximize replacement of gasoline vehicles with E85 FFVs and PHEVs/BEVs
5. Right-size vehicles to mission
6. Prioritize replacing least efficient vehicles
7. Install new E85 tank system at the gasoline island at West site refueling center
8. Install B20 at diesel refueling center
9. Expand EVSE in East and West Sites
10. Train drivers to use local E85 stations, and use FleetDASH to monitor performance
# Principle 1: Right-size Fleets to Mission

1. Shuttle, 2. Right-sizing Fleets and Vehicles, and 3. Vehicle Pooling

<table>
<thead>
<tr>
<th></th>
<th>Now</th>
<th>Shuttle</th>
<th>Right-size</th>
<th>Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>West Site Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compact Sedans</td>
<td>100</td>
<td>83</td>
<td>88</td>
<td>70</td>
</tr>
<tr>
<td>Midsize Sedans</td>
<td>115</td>
<td>92</td>
<td>72</td>
<td>60</td>
</tr>
<tr>
<td>LD Pickup</td>
<td>90</td>
<td>85</td>
<td>78</td>
<td>70</td>
</tr>
<tr>
<td>LD SUV</td>
<td>84</td>
<td>75</td>
<td>68</td>
<td>59</td>
</tr>
<tr>
<td>LD Minivan</td>
<td>78</td>
<td>71</td>
<td>65</td>
<td>57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>467</strong></td>
<td><strong>414</strong></td>
<td><strong>379</strong></td>
<td><strong>324</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Now</th>
<th>Shuttle</th>
<th>Right-size</th>
<th>Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>East Site Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compact Sedans</td>
<td>80</td>
<td>68</td>
<td>76</td>
<td>62</td>
</tr>
<tr>
<td>Midsize Sedans</td>
<td>110</td>
<td>88</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>LD Pickup</td>
<td>70</td>
<td>66</td>
<td>61</td>
<td>55</td>
</tr>
<tr>
<td>LD SUV</td>
<td>72</td>
<td>63</td>
<td>58</td>
<td>51</td>
</tr>
<tr>
<td>LD Minivan</td>
<td>64</td>
<td>57</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>396</strong></td>
<td><strong>350</strong></td>
<td><strong>318</strong></td>
<td><strong>275</strong></td>
</tr>
</tbody>
</table>

New Shuttle Service
Principle 2: Increase Fleet Fuel Efficiency

Reduce per mile GHG emissions by acquiring more efficient vehicles:

- Right-sizing vehicles to mission
- Replacing older less efficient vehicles
- Acquiring HEVs

Source: fueleconomy.gov
**Principle 3: Use Alternative Fuels, Including Electricity**

- Install **B20** at Diesel Refueling Station
- Install **E85** at Gasoline Refueling Station
- Increase Use of Local **E85 Station (Sheetz)** 2 miles from East Site
- Maximize **AFVs in the fleet**
- Increase **AF use in AFVs**

### Maximize AFVs in the fleet

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Now</th>
<th>FY22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>674</td>
<td>158</td>
</tr>
<tr>
<td>E85 FFV</td>
<td>575</td>
<td>698</td>
</tr>
<tr>
<td>Diesel</td>
<td>295</td>
<td>267</td>
</tr>
<tr>
<td>HEV</td>
<td>33</td>
<td>73</td>
</tr>
<tr>
<td>PHEV/BEV</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,580</td>
<td>1,231</td>
</tr>
</tbody>
</table>

### Increase AF use in AFVs

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Now</th>
<th>FY22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>668,500</td>
<td>142,000</td>
</tr>
<tr>
<td>Diesel</td>
<td>392,950</td>
<td>76,400</td>
</tr>
<tr>
<td>E85</td>
<td>54,900</td>
<td>231,500</td>
</tr>
<tr>
<td>B20</td>
<td>-</td>
<td>294,200</td>
</tr>
<tr>
<td>Electricity</td>
<td>790</td>
<td>4,900</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,117,140</td>
<td>749,000</td>
</tr>
</tbody>
</table>