INL/CON-22-67127-Revision-1

FedFleet 2022: Federal Automotive Statistical Tool - FY 2021 Fleet Trends and Data Quality

May 2022

Ron Stewart

Changing the World's Energy Future

INL is a U.S. Department of Energy National Laboratory operated by Battelle Energy Alliance, LLC

INL/CON-22-67127-Revision-1

FedFleet 2022: Federal Automotive Statistical Tool - FY 2021 Fleet Trends and Data Quality

Ron Stewart

May 2022

Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517, DE-AC07-05ID14517

Federal Automotive Statistical Tool

FY 2021 Fleet Trends & Data Quality

FedFleet 2022

INL/CON-22-67127.001

FY 2021 Fleet Data

Datacall Overview ● Comparison to Recent Years ● High-level Trends

Data Call Overview

- **Fleet data submissions from 49 agencies**
- **Timeline**
  - Data call opened October 1, 2021
  - … closed December 15, 2021
  - Review feedback to agencies January 24, 2022
  - Agency updates due February 21, 2022
  - Dataset declared final February 25, 2022
- **Dataset**
  - 706K vehicles
  - 1.06M fuel entries
  - 32.5M data points

FY 2021 Federal Fleet by the Numbers

Inventory

657K vehicles

vs FY 2020: -0.1% ↓

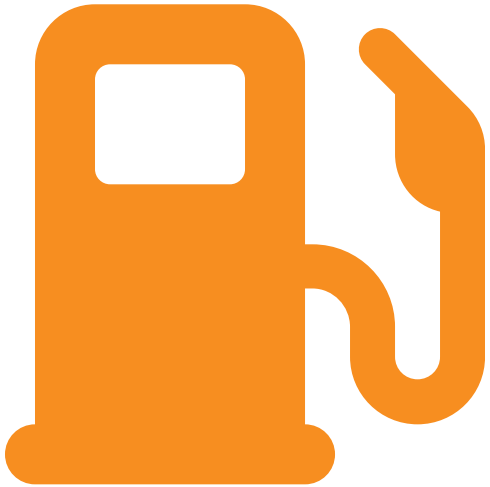
vs FY 2019: +1.8% ↑

Miles

4.22B miles

vs FY 2020: +1.5% ↑

vs FY 2019: -6.1% ↓



Fuel

368M GGEs

vs FY 2020: -1.1% ↓

vs FY 2019: -5.1% ↓

Cost

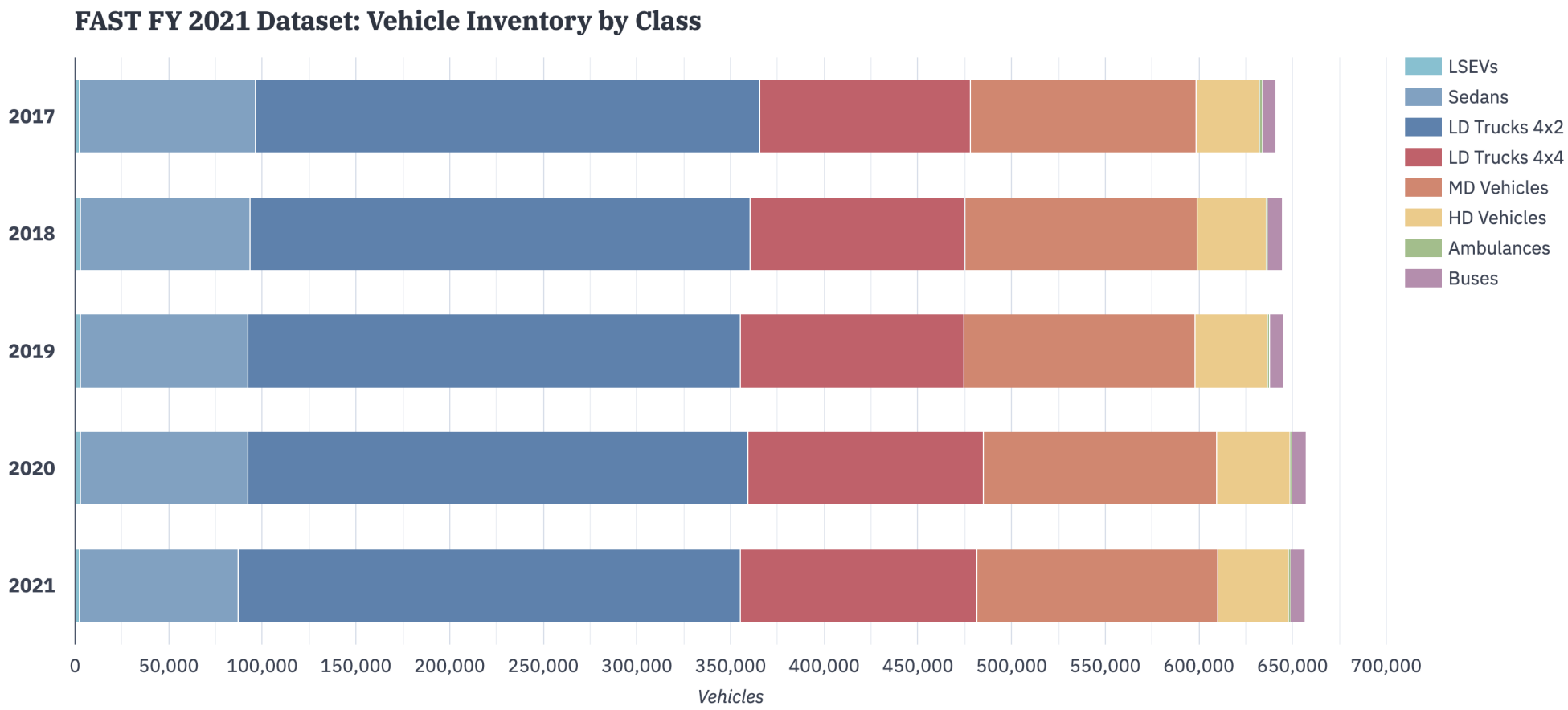
$ 4.44B

vs FY 2020: +5.0% ↑

vs FY 2019: +1.6% ↑

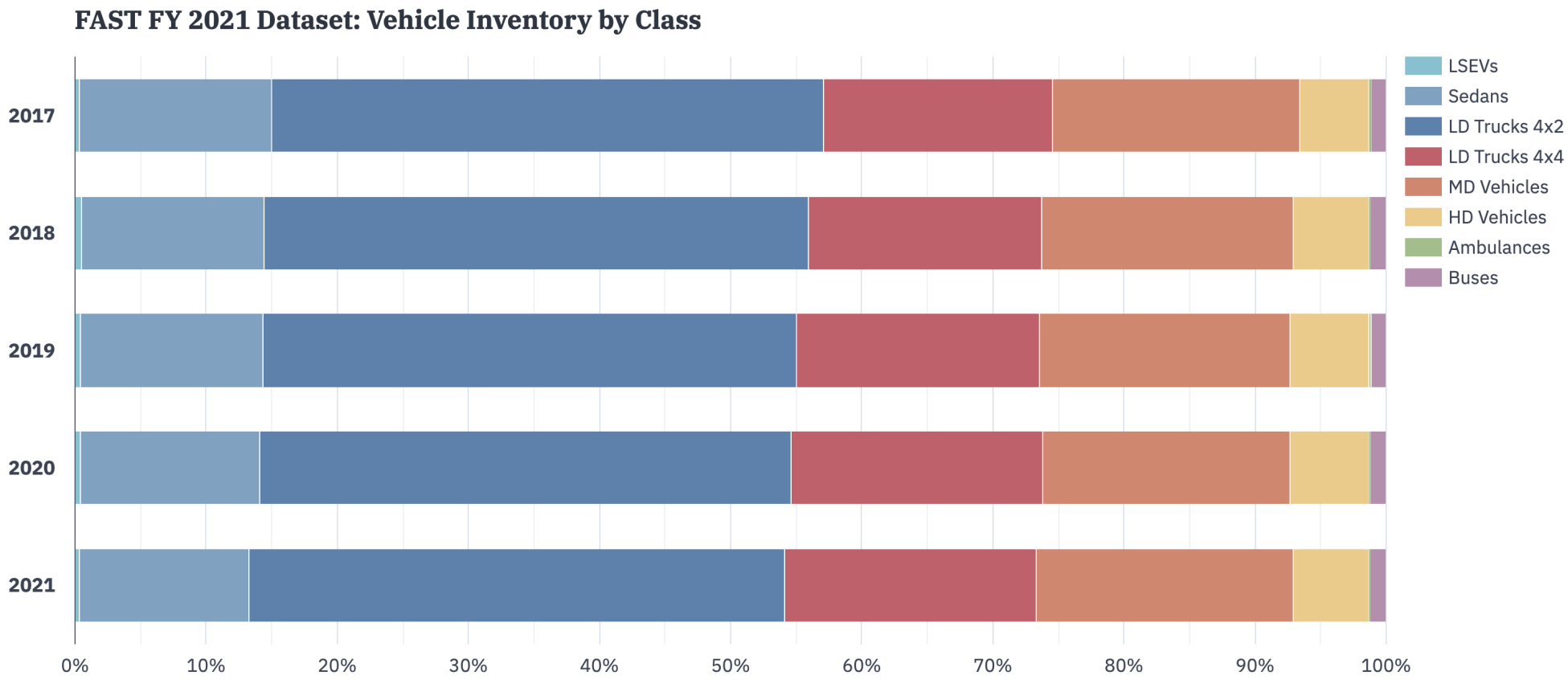
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/
Cost figures include only operating costs (lease, maintenance, accident repair, fuel, indirect costs, depreciation) and do not include costs associated with vehicle acquisition or disposal

Fleet Trends: Vehicle Inventory



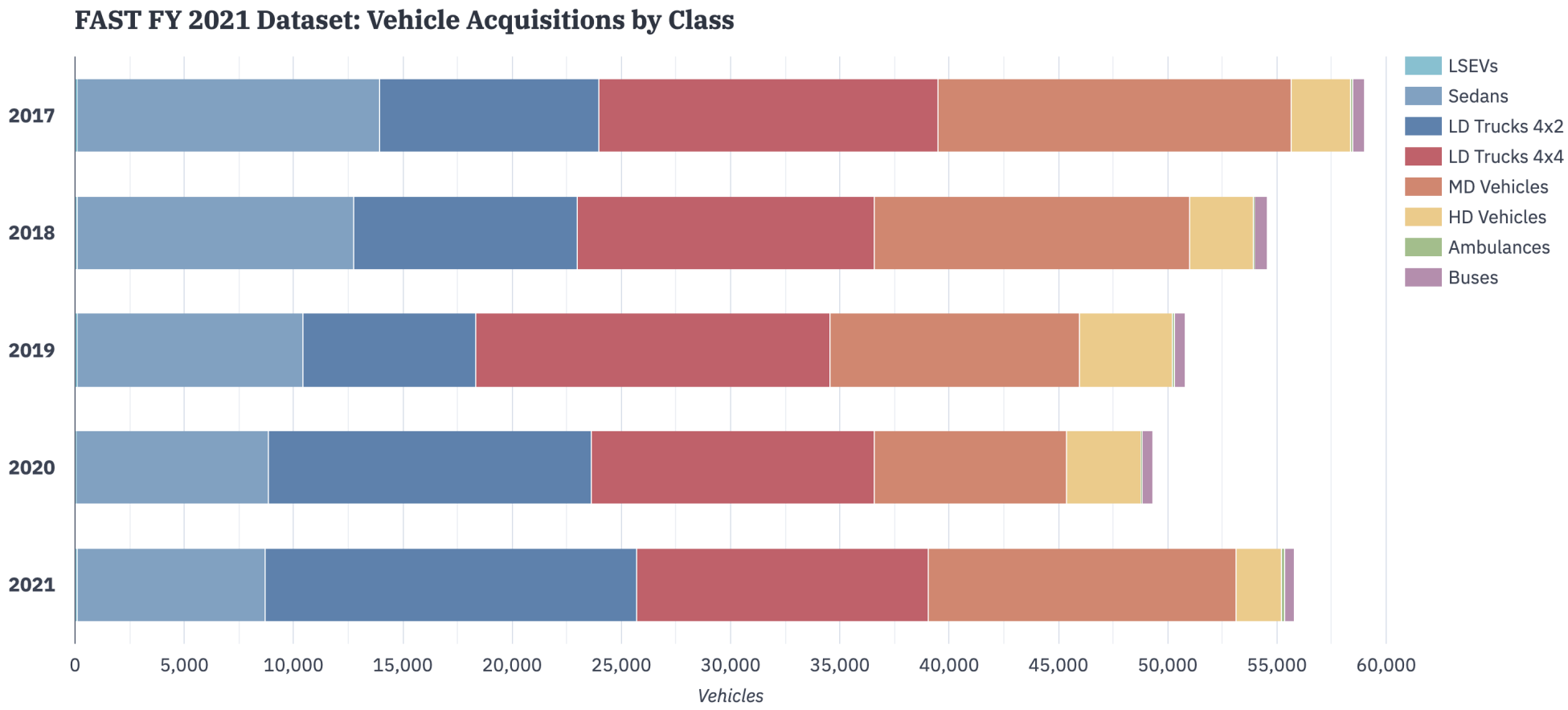
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Vehicle Inventory



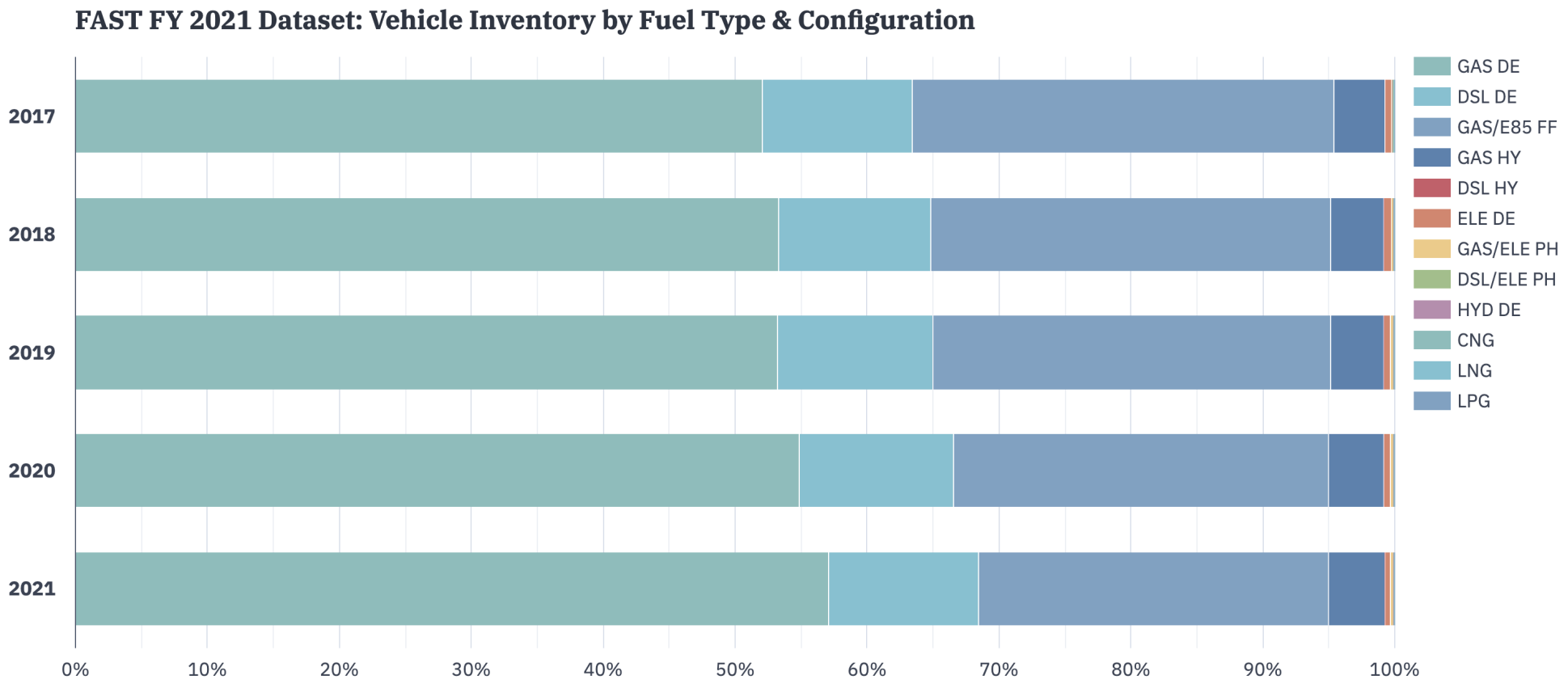
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Vehicle Acquisitions



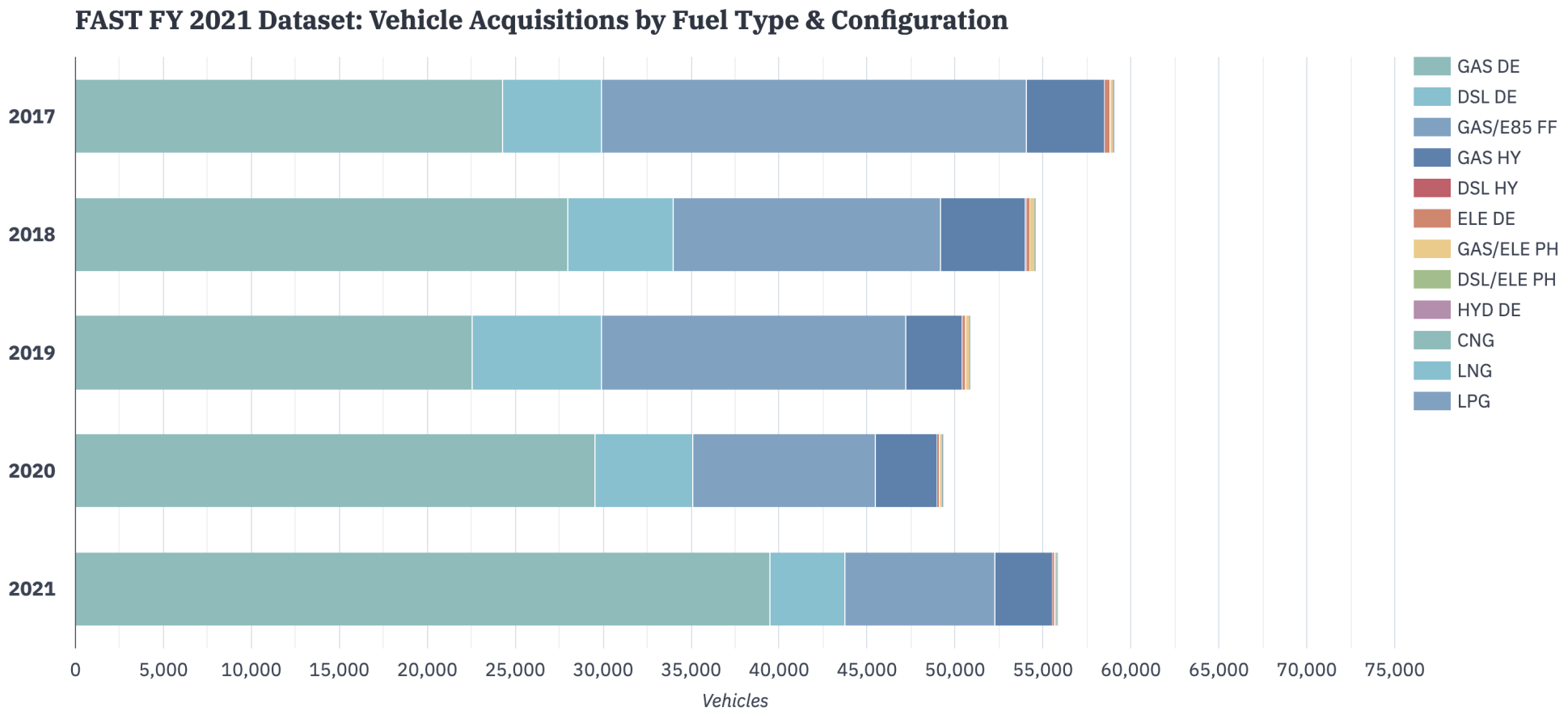
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Vehicle Fuel Type/Configuration



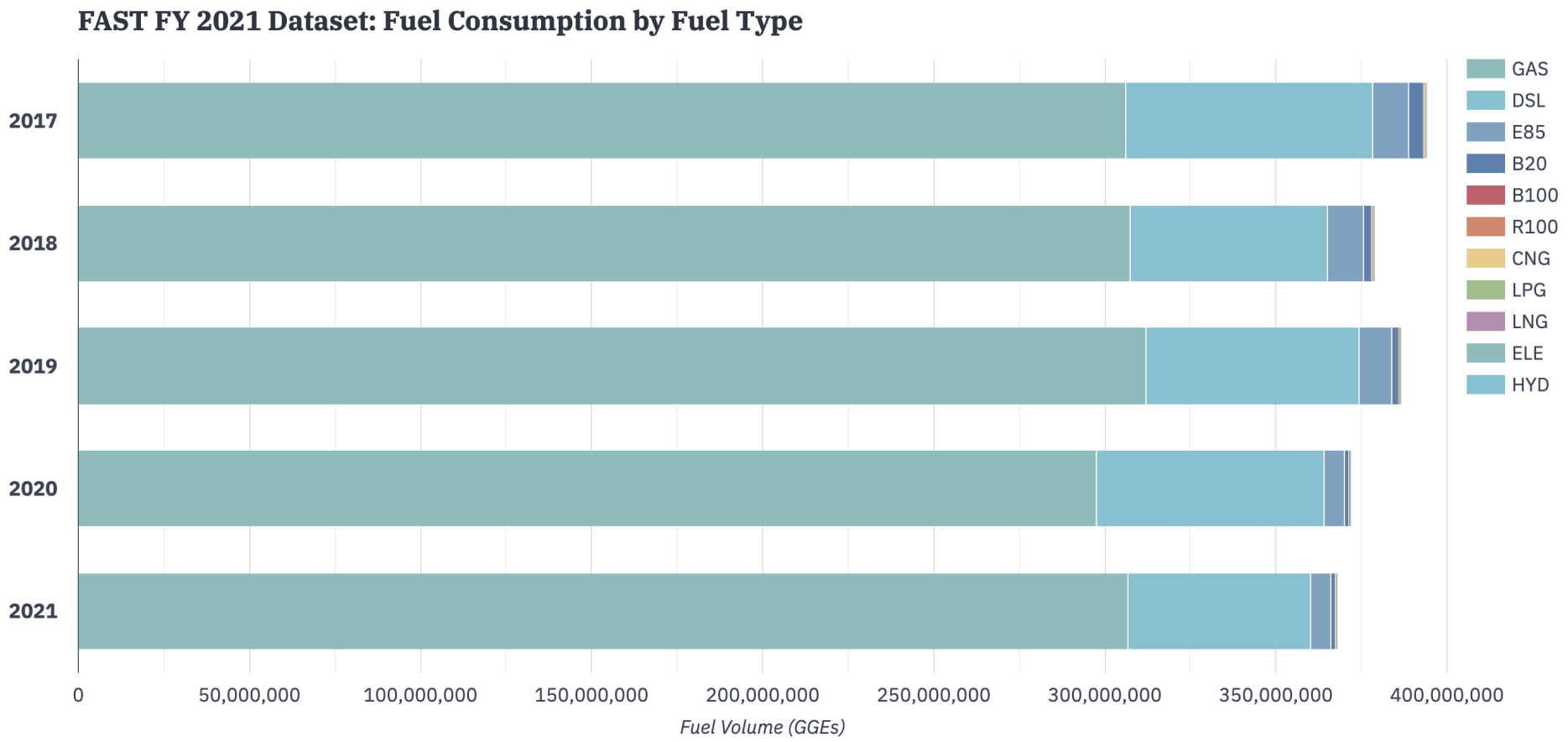
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Vehicle Fuel Type/Configuration



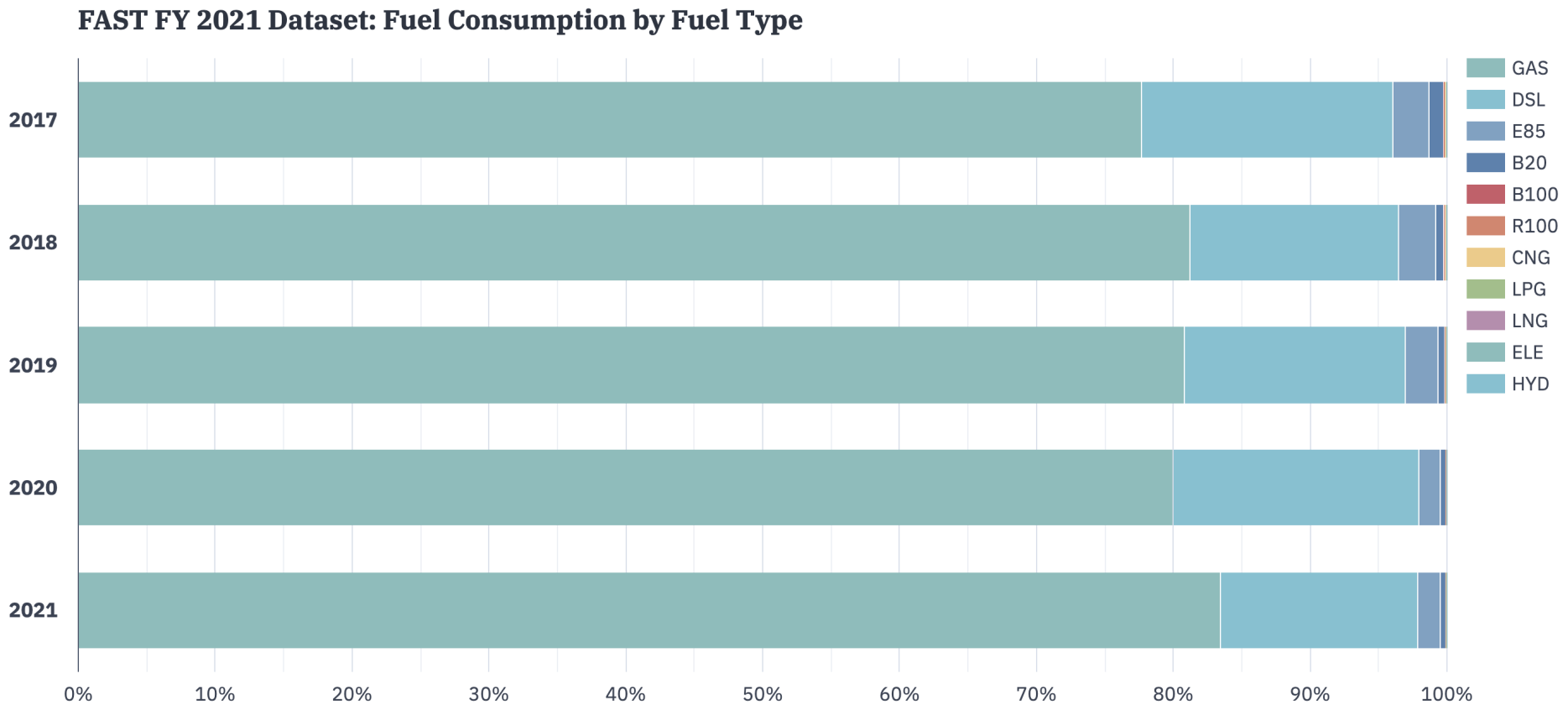
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Fuel Consumption



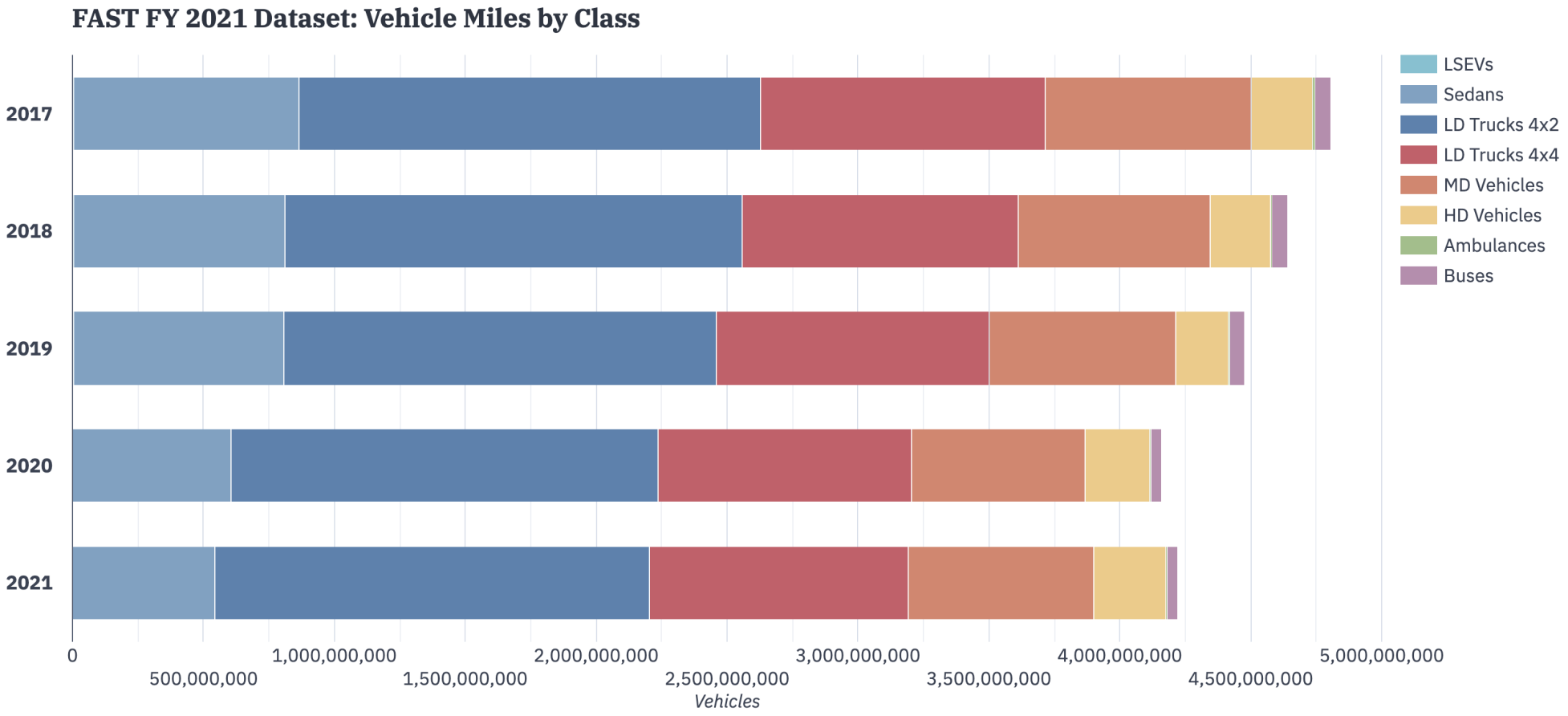
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Fuel Consumption



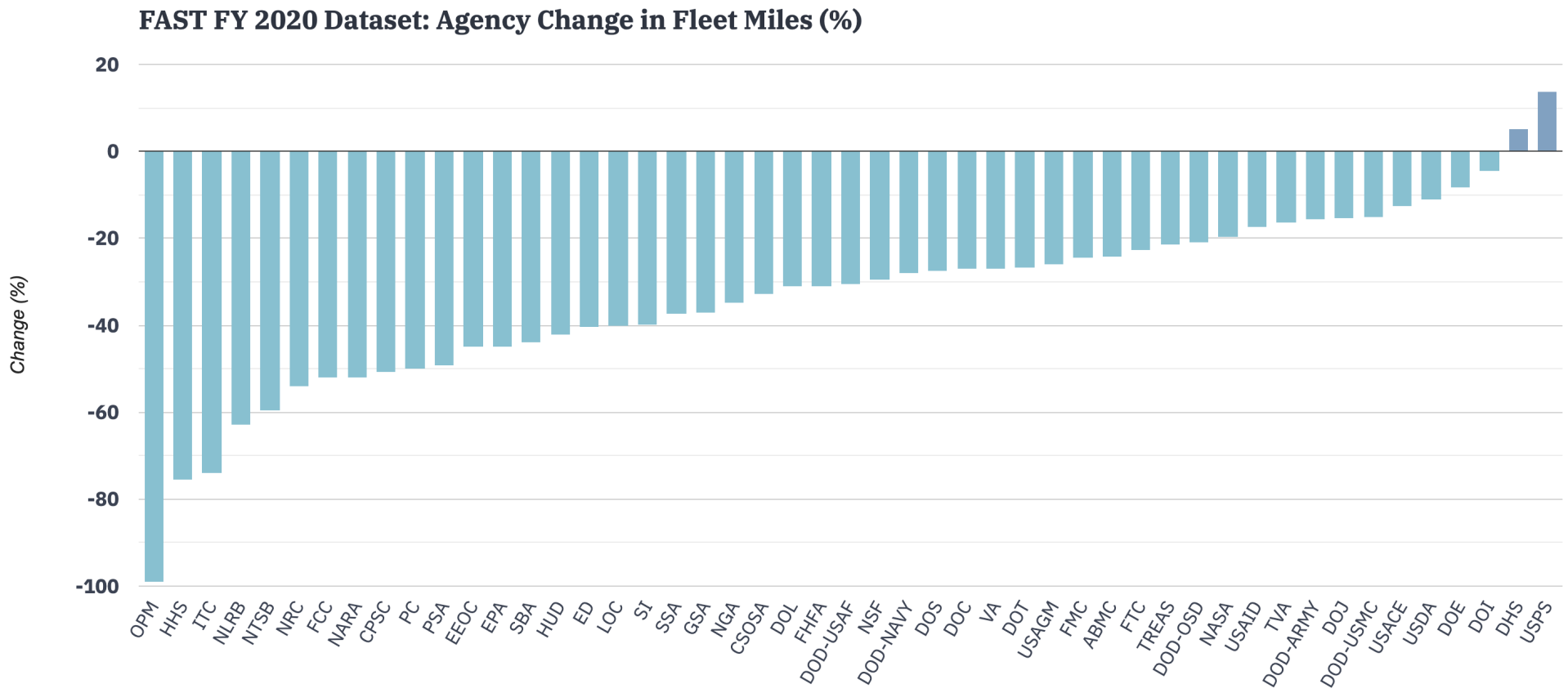
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Fleet Miles



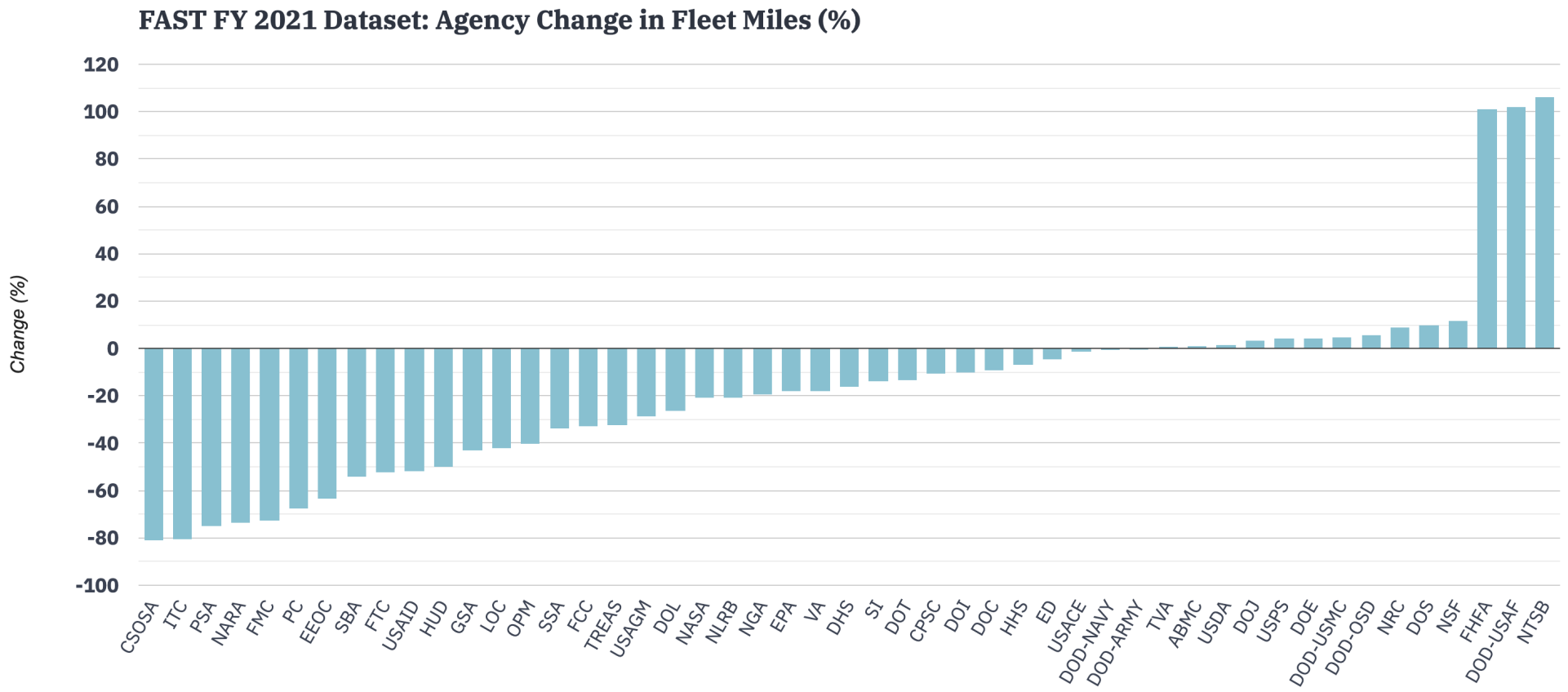
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Fleet Miles by Agency



Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Fleet Trends: Fleet Miles by Agency



Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

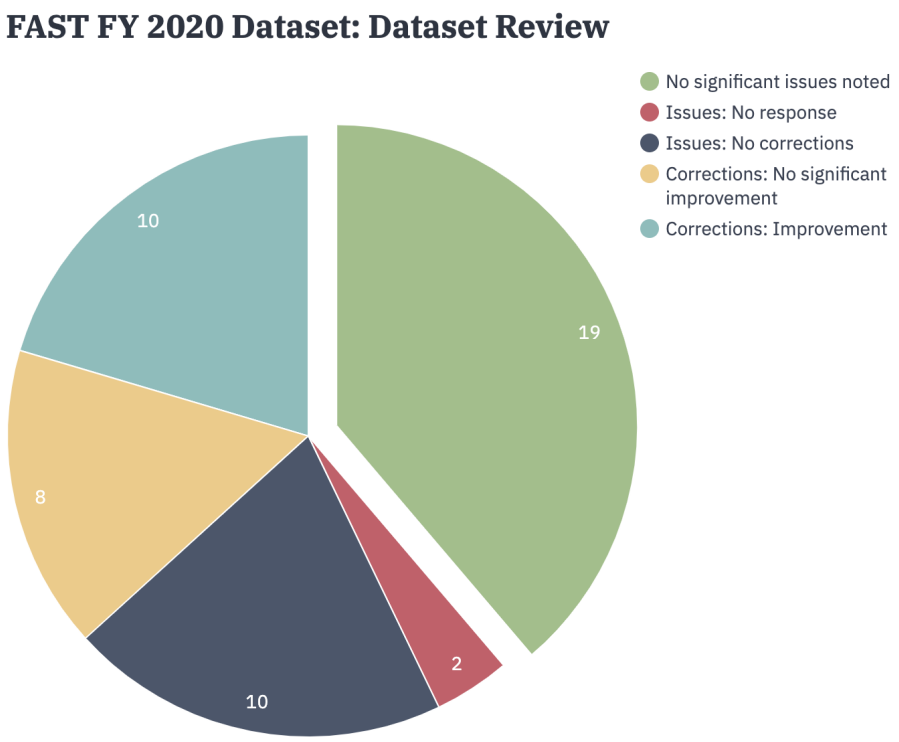
Data Quality

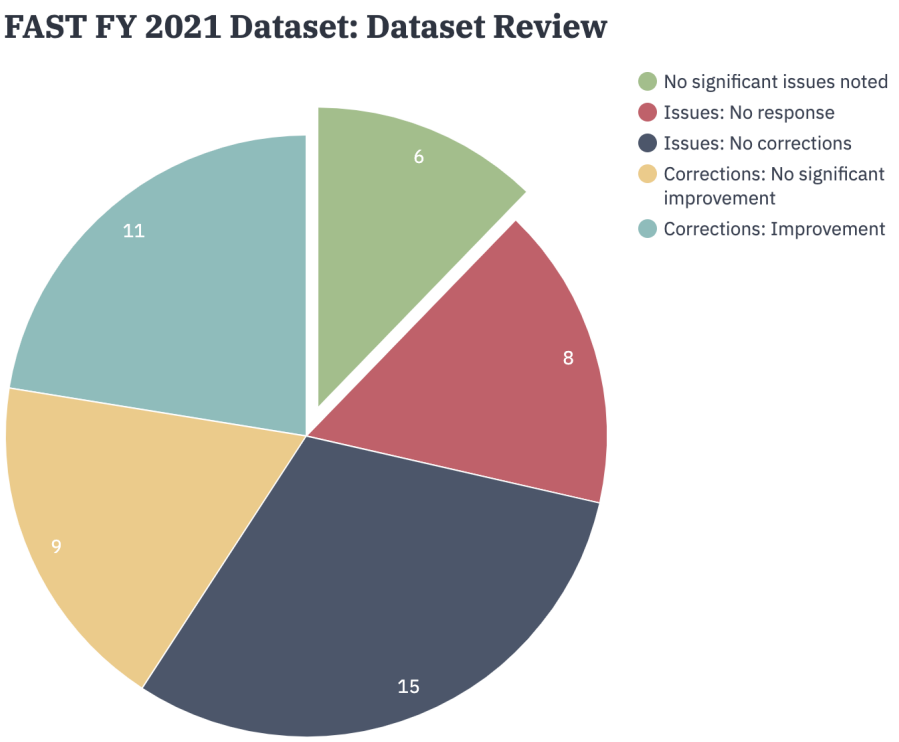
Review Process ● Quality Metric ● Another Way to Look at Quality?

Data Quality: Our Review Process

- **Agency submissions reviewed against 8 groups of metrics**
  - 5 groups look at aggregated data for consistency with prior submissions
  - 3 groups look at individual vehicle-level data for specific types of year-to-year consistency, completeness, and quality concerns
- **All organizations received written feedback, with opportunity to provide updates to address any identified concerns**
  - EPAct-covered/scorecard agencies received additional compliance impact review

Data Quality: Our Review Process





Data Quality: Our Quality Metric

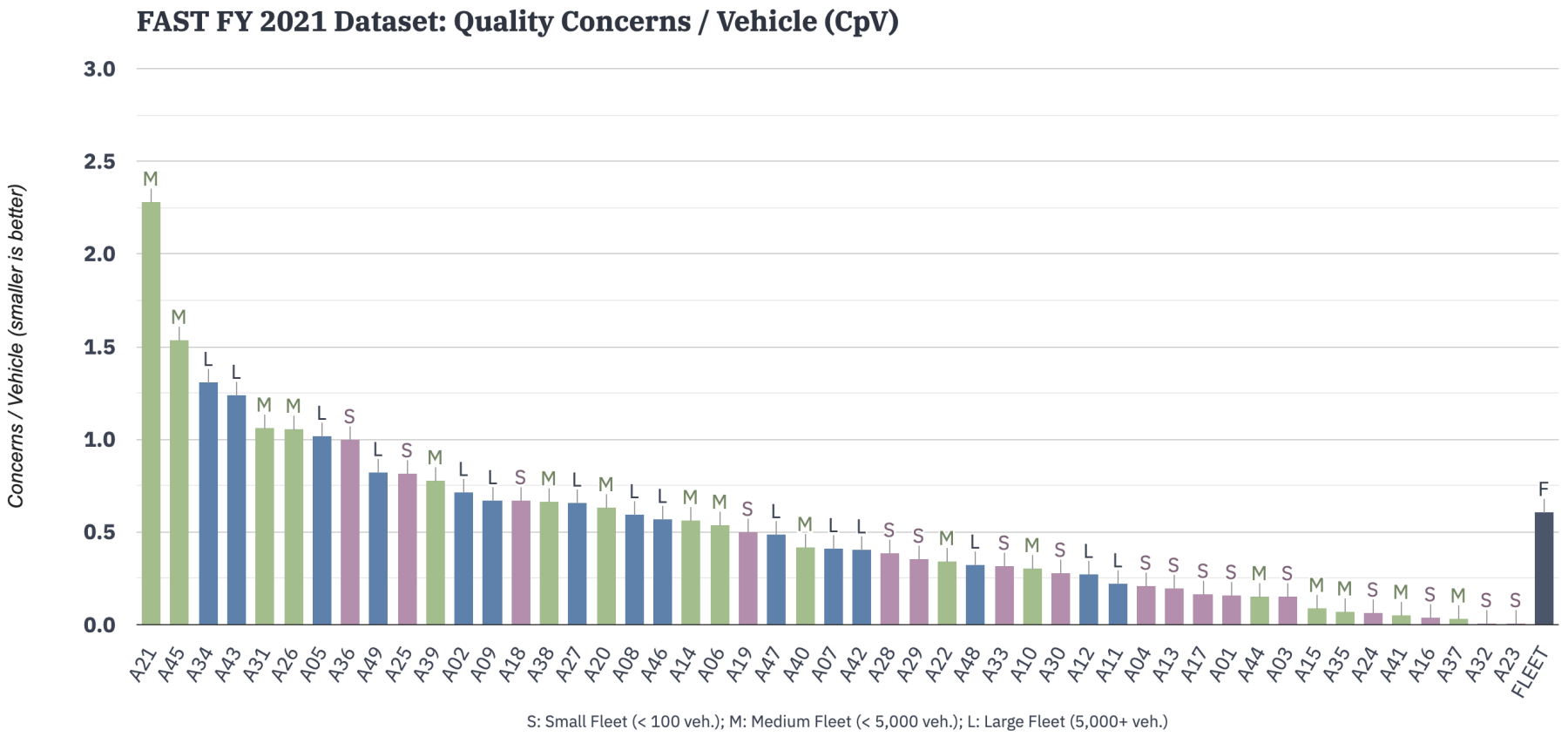
- **FY 2020, we piloted "Concerns per Vehicle" (CpV) quality metric**
  - Aggregate of occurrences of 12 types of problems
  - Enables comparison of quality over time or between agencies
  - Metric decreases? Fewer issues, improved quality
  - Metric increases? More issues, decreased quality
- **Measures come from both input validation and post-submission review**
- **Overall CpV scores**
  - FY 2020: 0.76
  - FY 2021: 0.60 (~20% improvement)

Data Quality: Our Quality Metric

Quality metric aggregates counts of individual measures:

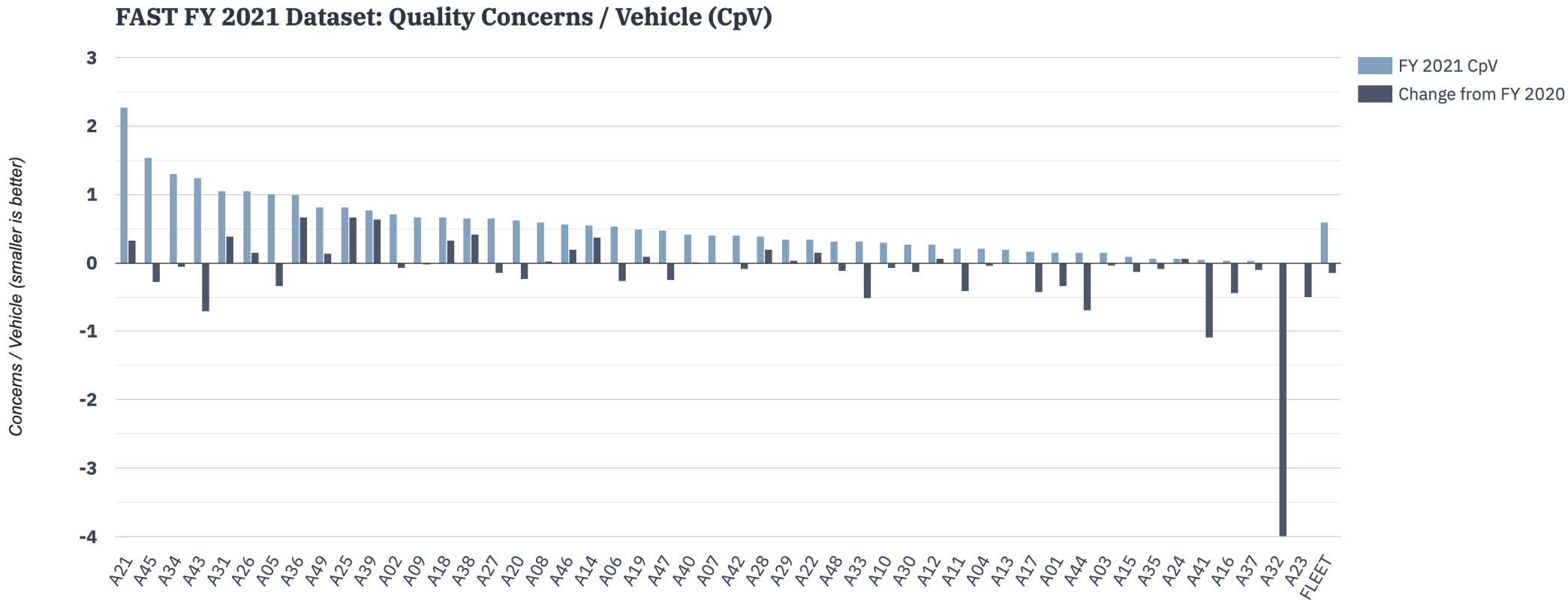
- **OC-1.5:** Inconsistent year-to-year acquisition costs
- **F-2.2:** Consumption of fuel inconsistent with vehicle fuel type/config
- **F-2.3:** Consumption of B100 w/o DSL
- **F-2.4:** PHEVs w/o ELE consumption
- **F-4.6:** Invalid high fuel efficiency
- **F-5.5:** Unreasonable fuel cost
- **M7(a):** Acquisition dates in current year and reported in prior year
- **M7(b):** Acquisition dates in prior year and not reported in prior year
- **M7(c):** Disposal information reported in prior year and reported again in current year
- **M7(d):** Reported in prior year and not reported in current year
- **M7(e):** Year-to-year changes of static vehicle attributes
- **M8:** Use placeholder values for key vehicle attributes

Data Quality: Our Quality Metric



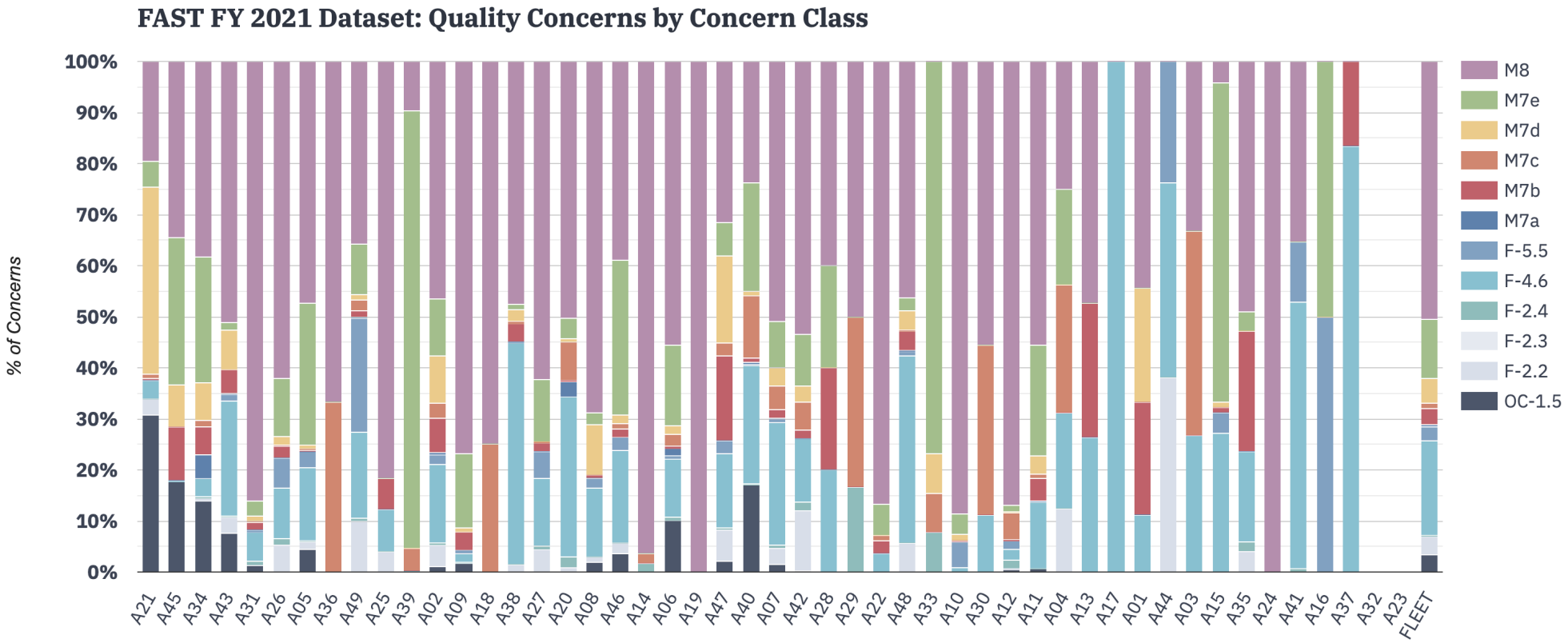
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Data Quality: Our Quality Metric



Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Data Quality: Our Quality Metric



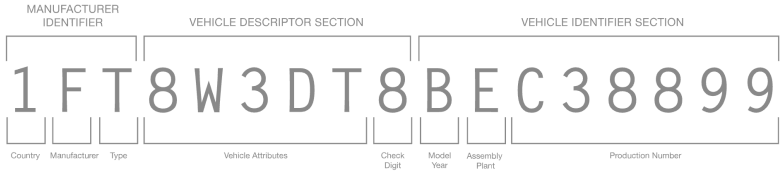
Source: Federal Automotive Statistical Tool, https://fastweb.inl.gov/

Data Quality: Another Way of Looking at It?

- **Our current review processes look at consistency and "reasonable-ness"**
- **Can we tell how accurate the data is?**
  - Short Answer: Not really
  - Nuanced Answer: Maybe, for certain aspects, by analyzing VINs used as Vehicle IDs for some of the vehicles?

Data Quality: VINs

- **All vehicles have VINs, but…**
  - … not all agencies use them for reporting
  - … some agencies that *do* use them for reporting have errors in their VINs
  - … multiple VIN standards for domestic vs international vehicles, large OEMs vs small
  - … VIN standards have changed over time
  - … not all manufacturers provide consistent detail to NHTSA
  - ... lots of info available from a VIN, but only a few attributes relevant to FAST reporting
  - … decoding VINs has historically been slow and/or expensive



Here is a table simplifying the VIN:

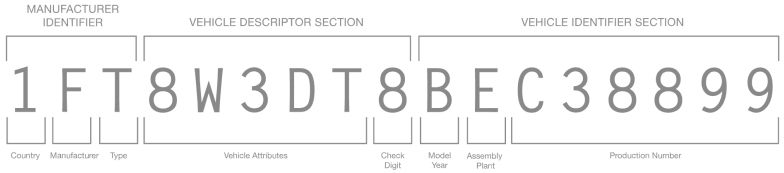
VIN Digit	Meaning
1st digit	Country
2nd digit	Region / Maker
3rd digit	Vehicle Type
4th digit	Vehicle Attributes
5th digit	Vehicle Attributes
6th digit	Vehicle Attributes
7th digit	Vehicle Attributes
8th digit	Vehicle Attributes
9th digit	Check digit

VIN Digit	Meaning
10th digit	Year
11th digit	Assembly Plant
12th digit	Sequential Number
13th digit	Sequential Number
14th digit	Sequential Number
15th digit	Sequential Number
16th digit	Sequential Number
17th digit	Sequential Number

Data Quality: VIN Decoding Analysis

- **DOT/NHTSA now shares a resource enabling bulk VIN decoding**

- **FAST team's preliminary analysis**
  - Decoded VINs from FY 2020 & 2021 datasets
  - Analyzed decoded information to determine what we can tell about vehicles
  - Compared vehicle attributes from VINs with agency-reported attributes to gauge aspects of accuracy



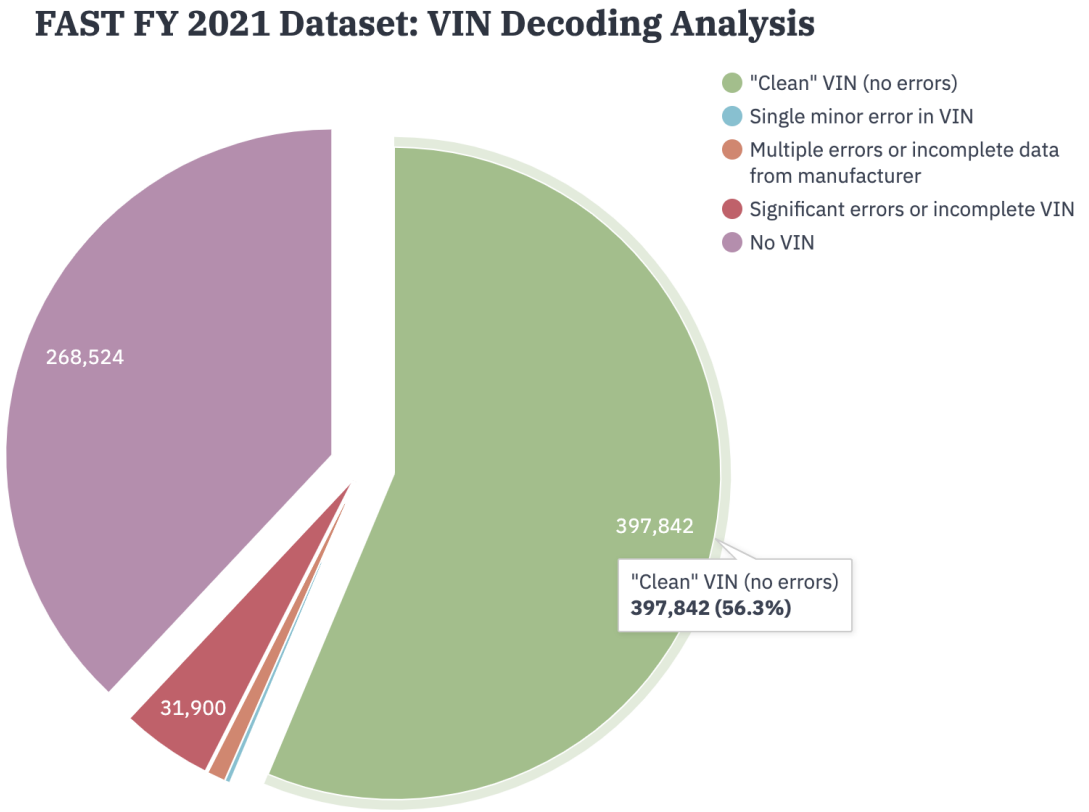
Here is a table simplifying the VIN:

VIN Digit	Meaning
1st digit	Country
2nd digit	Region / Maker
3rd digit	Vehicle Type
4th digit	Vehicle Attributes
5th digit	Vehicle Attributes
6th digit	Vehicle Attributes
7th digit	Vehicle Attributes
8th digit	Vehicle Attributes
9th digit	Check digit

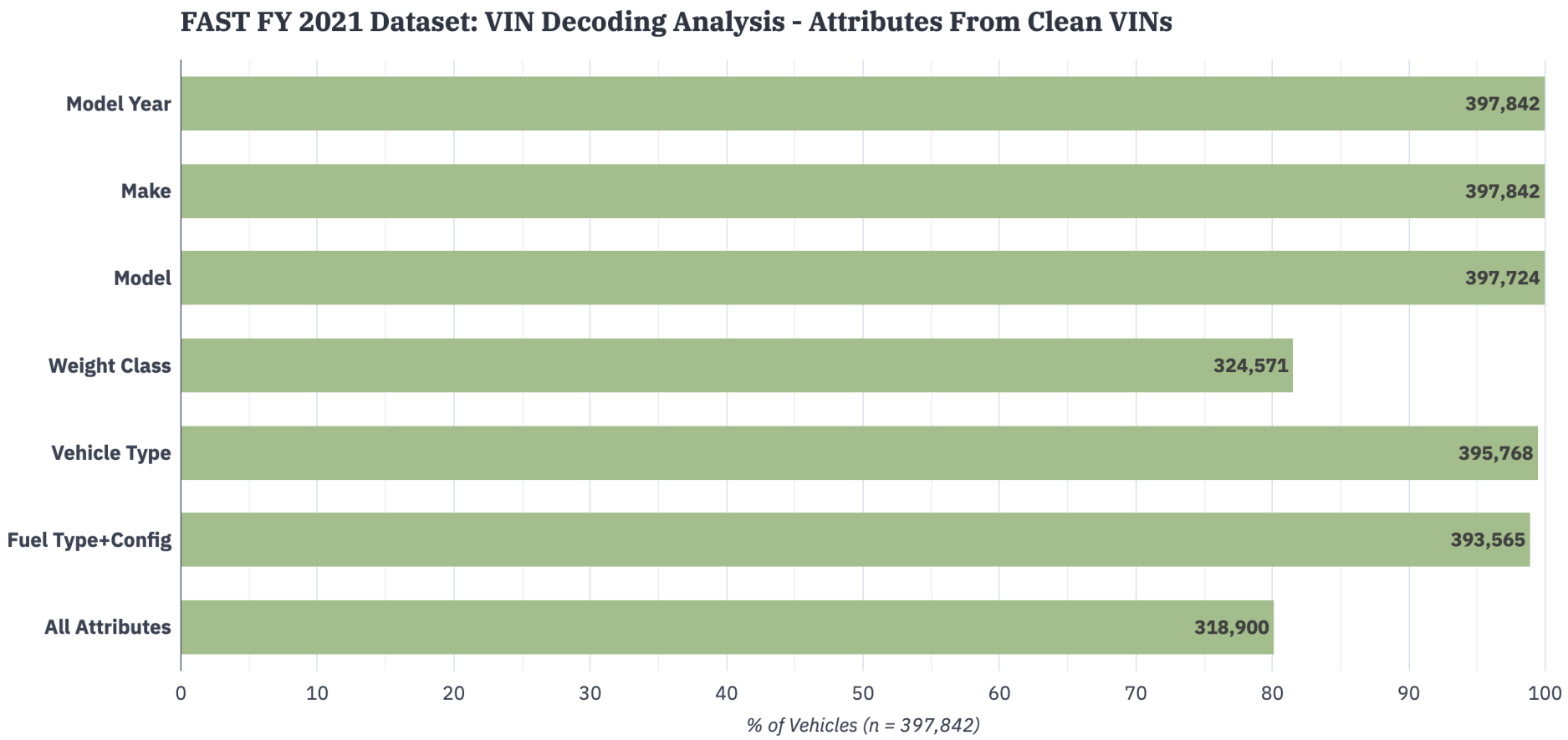
VIN Digit	Meaning
10th digit	Year
11th digit	Assembly Plant
12th digit	Sequential Number
13th digit	Sequential Number
14th digit	Sequential Number
15th digit	Sequential Number
16th digit	Sequential Number
17th digit	Sequential Number

Data Quality: VIN Decoding Analysis

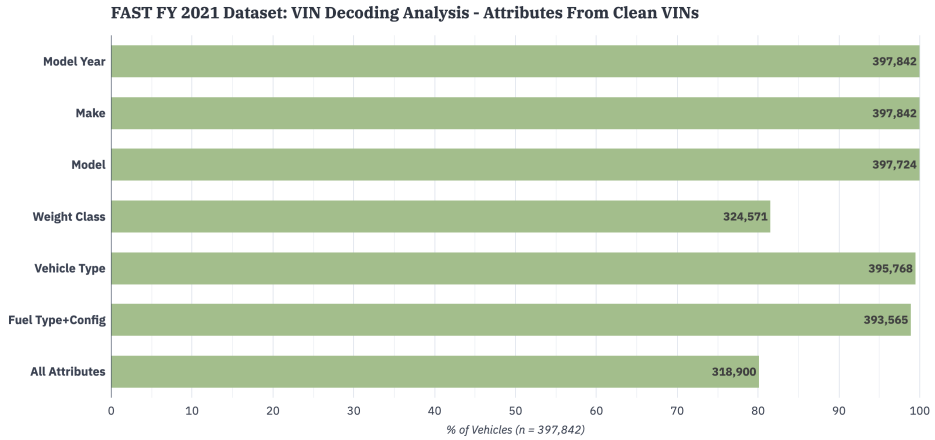
- **FAST FY 2021 dataset**
  - ~705K vehicles
  - ~438K vehicles with VIN(-ish?) ID
- **Decoded with DOT/NHTSA's vPIC decoding process**
  - Categorized VIN based on extent of errors noted in decoding
  - Identified FAST-relevant vehicle attributes available from VIN

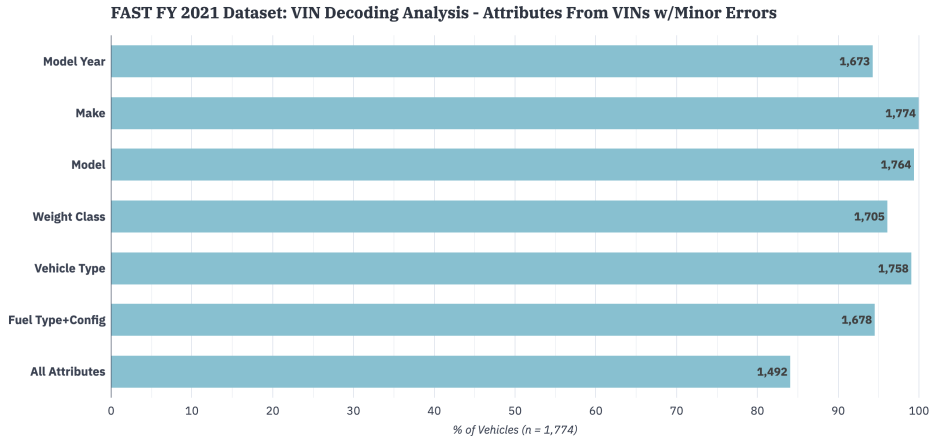


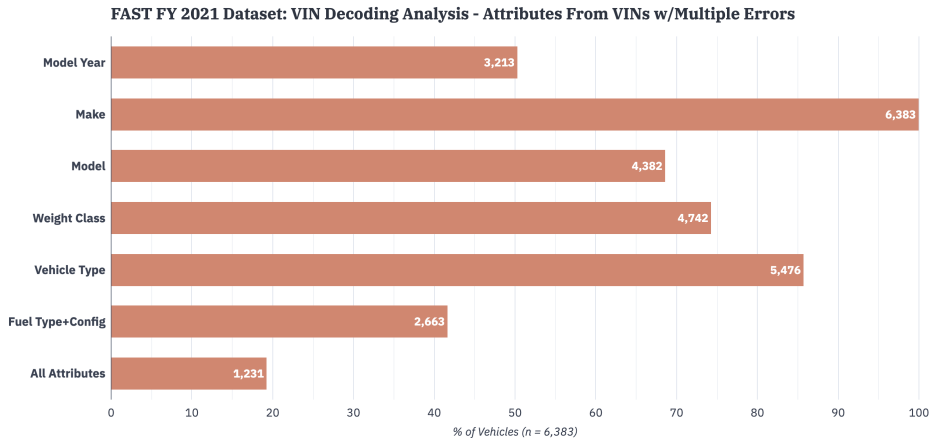
Data Quality: VIN Decoding Analysis

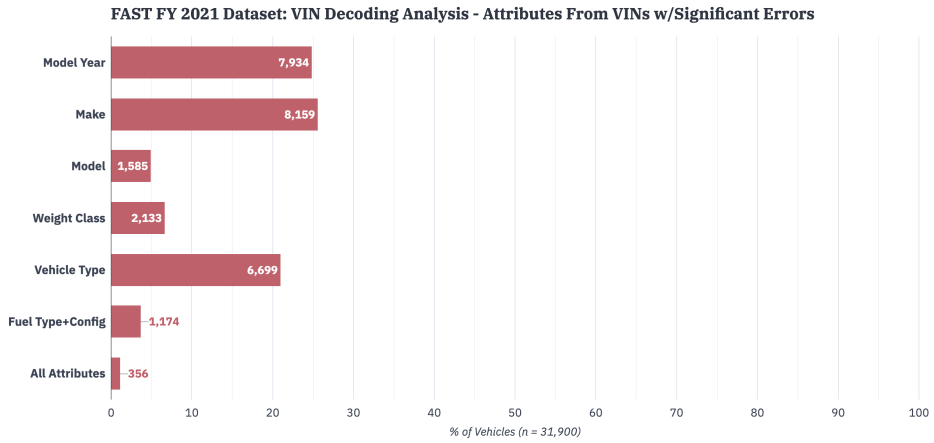


Data Quality: VIN Decoding Analysis

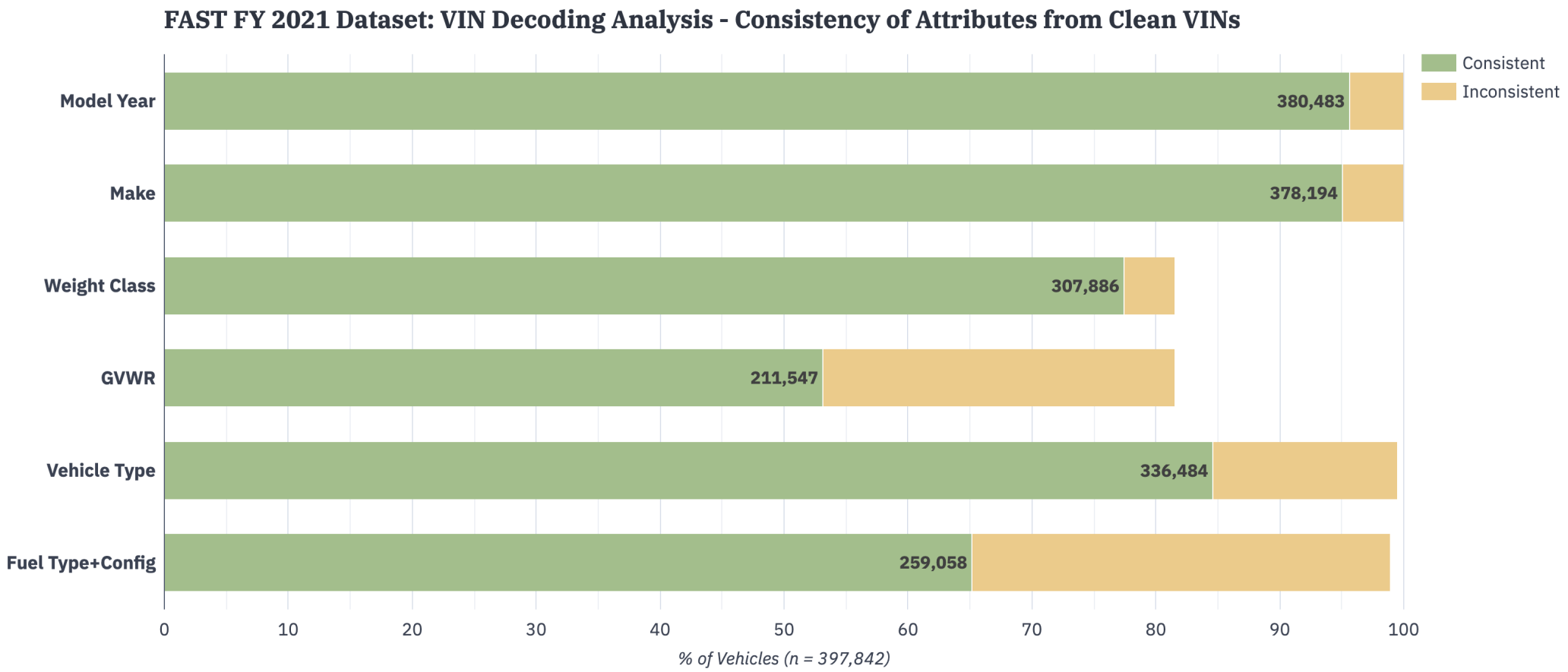








Data Quality: VIN Decoding Analysis



Data Quality: VIN Decoding Analysis – Preliminary Conclusions

- **Reporting vehicles by VIN would not be a comprehensive solution to ensuring accuracy**
  - Too many gaps and areas of uncertainty: previous listed… and more identified in our analysis
    - Missing or indeterminate weights from VIN
    - Indeterminate make from VIN
    - Indeterminate vehicle types (e.g., no way to identify ambulances, incomplete vehicles)
- **There may be benefits to reporting vehicles by VIN**
  - It does enable (limited) accuracy checking
- **Decoded data from VINs can help agencies improve consistency and accuracy of their data**
  - We can share decoded vehicle attributes with interested agencies
  - We would like to work with agencies to vet and improve our analysis

FAST – Coming Changes

FAST – Coming Changes

- **Changes to fleet reporting based on EO 14057 requirements**
  - Likely will be small number of additional vehicle attributes
    - Initially optional but will be required in future year reporting
    - Details and timing will be communicated to agencies (~ June 2022?)
  - Incorporation of EVSE planning/tracking reporting

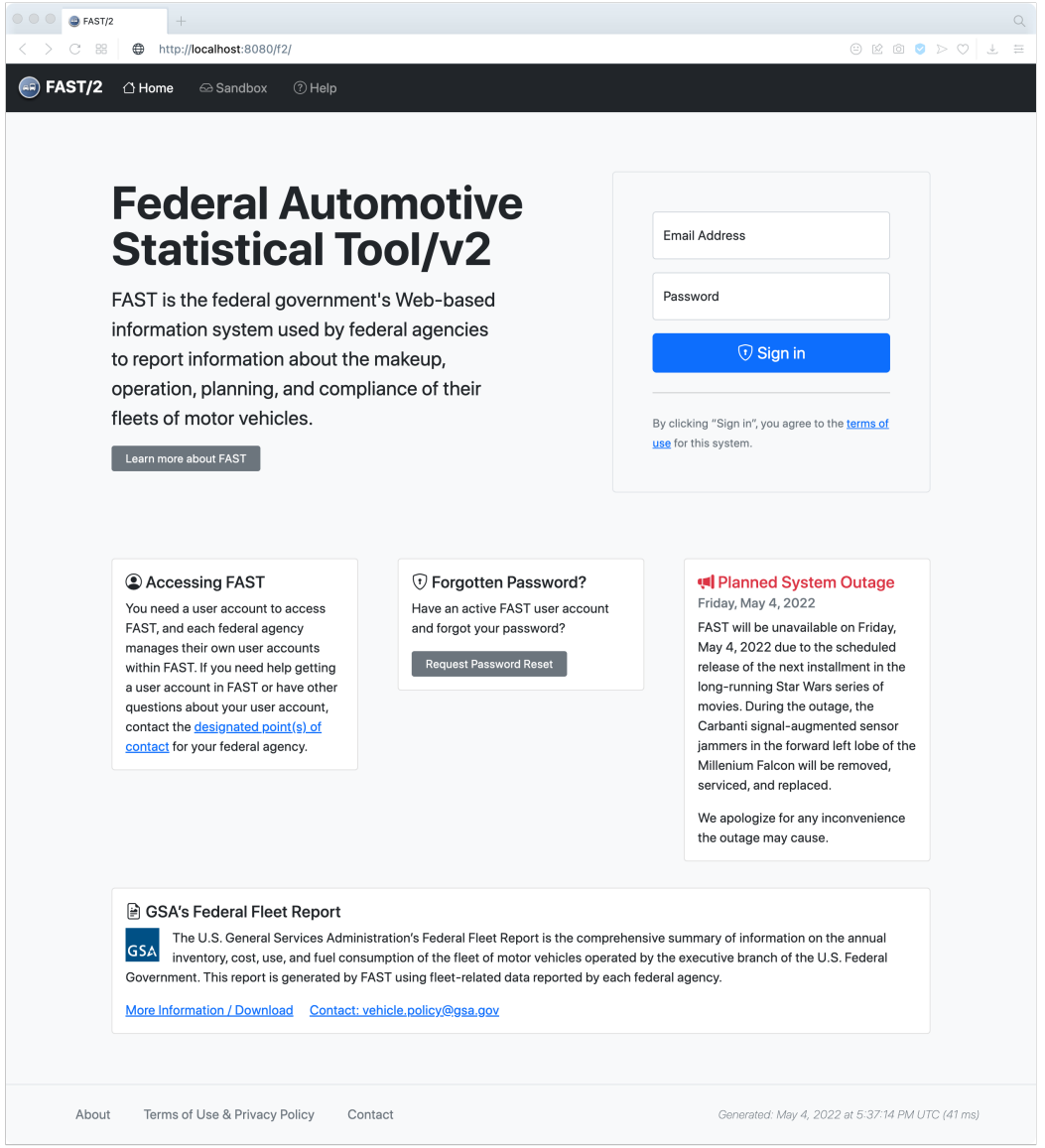
- **Tuning of validation business rules**
  - Usual annual review of range limits
  - Tuning of acquisition cost limits for armored vehicles
  - Consistency of fuel consumption locations for vehicles in outlying areas

FAST – Coming Changes

- **Tuning of validation business rules (cont'd)**
  - Changes to allowed content and length for fields like make and model
    - … from GSA Fleet's systems modernization project
    - … from VIN decoding analysis
  - Additional validation rules to improve the consistency of future-year projections data

FAST – Coming Changes

- **Some other interesting efforts brewing in the background…**



Contact Info

Ron Stewart

FAST Support Team

Idaho National Laboratory

ron.stewart@inl.gov

FAST

https://fastweb.inl.gov/

FAST Help

https://fastweb.inl.gov/help/

FAST Support Team

FASTsupport@inl.gov

Idaho National Laboratory

Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy. INL is the nation's center for nuclear energy research and development, and also performs research in each of DOE's strategic goal areas: energy, national security, science and the environment.