

ETA-FEP 001

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Fleet Test And Evaluation Procedure

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Appendix A; Typical Fleet Test Summary Data Sheet

1. Objectives

The objective of this procedure is to provide guidance for the establishment of advanced vehicle evaluation fleets, the collection of operating data from these fleets and the analysis of this data to provide evaluation of fleet operation. This procedure also provides guidance for the preparation of Fleet Data Sheets summarizing vehicle performance for use by the U.S. Department of Energy Advanced Vehicle Test And Evaluation Activity.

2.0 Purpose

The purpose of this procedure is to identify acceptable and repeatable methods for the implementation of advanced vehicle test fleets and the collection and analysis of such data for use with the U.S. Department of Energy Advanced Vehicle Test And Evaluation Activity.

3.0 Documentation

Documentation addressed by this procedure shall be consistent, easy to understand, easy to read and readily reproducible. This documentation shall contain enough information to "stand alone"; that is, be self-contained to the extent that all individuals qualified to review it could be reasonably expected to reach a common conclusion, without the need to review additional documentation.

4.0 Fleet Selection

Advanced vehicles selected for evaluation with the U.S. Department of Energy Advanced Vehicle Test And Evaluation Activity shall be operated in established fleets and their performance evaluated under fleet conditions. In order to optimize the opportunity to collect useful data, the following prerequisite conditions shall be evaluated for each vehicle and fleet prior to establishing each fleet test.

4.1 Test Diversity

To provide proper evaluation of the performance of an advanced vehicle, care must be taken to provide diverse data for evaluation. The following

diversity factors shall be considered in selecting the number of vehicles of a type to be tested and the number of fleets to be utilized to conduct such testing.

- The total miles to be accumulated in testing
- The possibility of losing a test vehicle to a traffic accident
- Operation of vehicles with various intensity (miles/month)
- Operation of vehicles in urban and highway environments
- Operation of vehicles in hot, cold and temperate climates
- Operation of vehicles over varying terrain

These factors will have varying significance for each type of advanced vehicle and shall be considered for each vehicle type tested.

4.2 Vehicle Mission

Fleets shall be selected which will utilize test vehicles in missions within the performance capability of the vehicle. This is particularly important for vehicles with range or payload limitations. For example, testing of a Neighborhood Electric Vehicle (NEV) should be conducted in fleets having vehicle missions that are within the range and speed limitations of NEVs. Testing of a Hybrid Electric Vehicle (HEV) should be conducted in fleets having missions predominantly in urban areas. The mission for each test vehicle shall be monitored on an ongoing basis to ensure that the vehicle continues to be operated within its performance capabilities. The Baseline Test data sheets, provided by the U. S. Department of Energy Advanced Vehicle Test And Evaluation Activity, provide such data for consideration.

4.3 Vehicle Maintenance

Vehicles shall be regularly serviced in accordance with the manufacturer's maintenance schedule. Before vehicles enter test operation, arrangements shall be in place defining what service is to be performed based on the manufacturer's maintenance schedule, when service will be performed, what organization will provide the service, and who will pay for such service. Routine maintenance, such as oil changes and tire rotations, may

be conducted by the fleet's normal service provider. Specialized maintenance shall be provided by an authorized dealer for the test vehicle. All maintenance activities shall be recorded in accordance with Section 5. regardless of whether the activity is covered by the manufacturer's warranty. Cost shall be recorded for all non-warranty vehicle maintenance.

4.4 Insurance Requirements

Before a vehicle begins test operation, proof of insurance of the vehicle shall be provided. Insurance may be provided by the operating fleet or by the test organization. In any case, the limits of liability shall be no less than \$300,000 per occurrence with a \$500,000 aggregate limit. The fleet manager shall ensure that all drivers of the test vehicle have a valid Driver's License issued from the state in which the vehicle will be operated.

4.5 Driver Training

Instructions shall be provided to the fleet manger for proper operation of the test vehicle. The fleet manager shall use his/her normal methods or disseminating such information to potential drivers of the test vehicle. All key aspects of the vehicle operator's guide, including vehicle fueling safety, shall be covered. For electric vehicles, particular attention shall be given vehicle range and charging.

4.6 Vehicle Fueling Infrastructure

All vehicle fueling infrastructure shall be in place and operational prior to commencement of vehicle operation. Special attention should be given to ensure that measurement of fuel used by the test vehicle is available when required as a test objective. Collection of this data for alternative fuel vehicles is often complicated by lack of measurement capability (e.g. gaseous fuels) or by multiple vehicles using a single fueling point (e.g. electric vehicles sharing a charger). The test vehicle mission shall be reviewed to verify that sufficient fueling infrastructure is in place to properly support vehicle operation. Safety aspects of vehicle fueling shall be established and reviewed with potential drivers of the test vehicle (see Section 4.5).

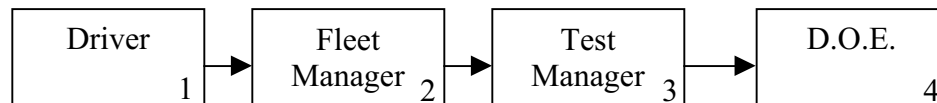
4.7 Test Objectives

Prior to test vehicle operation, the objectives of the test shall be presented to the Fleet Manager in writing. At a minimum, this shall include the following objectives;

- Test mileage per month required,
- Overall test duration in miles and months,
- Data requirements,
- Vehicle mission requirements,
- Vehicle service requirements,
- Refueling requirements (if any), and
- Driver training requirements (if any).

5.0 Data Collection

Data shall be collected in accordance with the following diagram.



- 1 - Log sheets format or electronic data entry
- 2 - E-mail, or spreadsheet in electronic format
- 3- Spreadsheets containing the data for all fleet testing vehicles in column order VIN, license plate, monthly odometer, monthly mileage, fuel used (if applicable), number of fast charges (if applicable)

If no Fleet Manager exists for a particular test fleet, data shall be provided directly to the Test Manager.

5.1 Fleet Output Data

The following data shall be provided monthly by the Fleet Manager to the Test Manager;

- Odometer reading for every test vehicle,
- Fuel consumption for the vehicle,
- Maintenance required and the date and cost of such maintenance, and

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- Any unusual events vehicle operating events, particularly if the vehicle quit on the road.

The Test Manager shall endeavor to obtain complete data each month. However, this will often not be possible. Therefore, the Test Manager should utilize the following techniques to interpolate missing data.

- Interpolate same data linearly for missing months.
- Infer missing data using alternate data and average proportionality (e.g. fuel used from miles driven and average fuel economy).

Care should be taken not to interpolate data over an excessive number of months or across periods when average factors may be changing (e.g. summer to winter).

5.2 Fleet Summary Data

The following data shall be provided monthly by the Test Manager to the U.S. Department of Energy.

- Monthly mileage by vehicle model
- Cumulative mileage by vehicle model
- Monthly fuel economy by vehicle model
- Cumulative fuel economy by vehicle model
- Monthly fleet mileage
- Cumulative fleet mileage
- Monthly fleet fuel economy
- Cumulative fleet fuel economy
- Number of Fast Charge by vehicle model/battery type (if applicable)
- Repair work
- Incident on any vehicle
- Maintenance cost by vehicle model

6.0 Data Analysis

Test data should be evaluated on an ongoing basis to ensure the integrity of the fleet test. Upon completion of the fleet test, data from each test vehicle shall be summarized in the form of a data sheet.

6.1 Ongoing Data Analysis

On a monthly basis, data should be examined for reasonableness and completeness. Missing data should be investigated and a determination made if supplemental collection methods should be implemented or data should be interpolated (see Section 5.1). Supplemental collection methods, which should be considered if data is routinely missing, include the following;

- Transferring the test vehicle to a more conscientious fleet,
- Follow up by the Test Manager with the Fleet Manager specific to the missing data to determine why it was missing and to develop corrective action to improve collection reliability, and
- Collection of data by the Test Manager or his/her representative.

It is the responsibility of the Test Manager to ensure that sufficient data is collected to accurately evaluate performance of the test vehicle.

6.2 Fleet Test Summary Data Sheet

Upon completion of testing, a Fleet Test Summary Data Sheet shall be prepared for each test vehicle or group of identical vehicles operating in a single fleet. A typical data sheet format and content is presented in Appendix A. Information shall be presented in the data sheet in accordance with the following guidelines.

Description

This section of the data sheet provides a brief summary of the operating fleet characteristics. Fleet mission, location and typical trip characteristics should be presented.

Major Operations & Maintenance Events

This section of the data sheet provides a summary of major operating and maintenance events. Significant repairs and maintenance should be summarized along with their cost and vehicle mileage at the time of the repair or maintenance. If the repair or maintenance is covered by the base vehicle warranty, no cost should be shown. Rather the repair or maintenance should be noted as being covered by warranty. All vehicle failures on the road should be summarized along with the cause and mileage at which the failure occurred.

Operating Cost

This section of the data sheet provides the following cost data;

Purchase Cost - Purchase cost includes vehicle cost with options, delivery, dealer preparation costs, title fees, and taxes. It does not include annual registration and license costs or costs for extended warranties.

NADA Used Vehicle Price - The NADA used vehicle price is the published National Automobile Dealers Association retail price in the month the vehicle was sold, or for vehicles still in operation, the month that the data sheet was prepared.

Sale Price - The sale price is the actual cash price received for the evaluation vehicle at the time of sale. For vehicles still in operation, no sale price is provided. Rather, it is noted that the vehicle is still in operation.

Maintenance Cost - Maintenance cost includes the actual cost for all non-warranty maintenance divided by the total mileage of the evaluation vehicle for the period covered by the data sheet. Work covered under extended warranties purchased to cover the evaluation vehicle shall be costed as part of maintenance cost.

Operating Cost - Operating cost includes the actual cost for all fuel, licenses and permits required to operate the vehicle divided by the total mileage of the evaluation vehicle for the period covered by the data sheet. For electric vehicles, fuel cost shall be calculated using the kilowatt-hours consumed by the vehicle multiplied by an electric energy cost as obtained from "Electric Power Monthly" (DOE/IEA-0226) for the month in which the vehicle test concluded.

Total Ownership Cost - Total ownership cost includes the Purchase Cost less the Sale Price (or NADA Used Vehicle Price for vehicles still in operation) divided by the total mileage of the evaluation vehicle for the period covered by the data sheet, plus Maintenance Cost and Operating Cost.

Operating Performance

This section of the data sheet summarizes the total miles driven for the period covered by the data sheet and the cumulative fuel economy (in gallons of gasoline or gasoline equivalent per mile).

Vehicle Specifications

This section of the data sheet presents significant vehicle specifications including engine type and power, hybrid drive type and power (as applicable), battery type (as applicable), number of seating positions, vehicle payload, and significant vehicle features/options.

7.0 Glossary

- 7.1 Effective Date - The date, after which a procedure has been reviewed and approved, that the procedure can be utilized in the field for official testing.
- 7.2 Fleet Manager - The individual within a fleet organization responsible for providing fleet operating data and overseeing operation of test vehicles.
- 7.3 Shall - Items which require adherence without deviation. Shall statements identify binding requirements. A go, no-go criterion.
- 7.4 Should - Items which require adherence if at all possible. Should statements identify preferred conditions.
- 7.5 Test Manager - The individual within Electric Transportation Applications responsible for the implementation of the fleet testing program.

APPENDIX-A
Typical Fleet Test Summary Data Sheet

HEV America

Advanced Vehicle Testing Activities



2003 Civic Hybrid

VIN #
JHMES96663S003864



*Less dependence
on Foreign oil,
and eventual
transition to an
emissions-free,
petroleum-free
vehicle*

Fleet Performance

Description:

This vehicle was operated throughout the State of Arizona by Bank One of Arizona's courier pool. It was operated 24 hours a day, six days a week, transferring documents between branches and a central processing center located in Phoenix on city streets and urban freeways as well in intrastate courier routes, with typical high-speed round trips of 100 to 300 miles.

Major Operations & Maintenance Events:

CVT transmission failed @ 96,802 miles
Cost: \$3,500
Catalytic converter failed @ 97,750 miles
Cost: \$1,124

Operating Cost:

Purchase Cost: \$23,174 (5/02)*
NADA Used Vehicle Price: \$12,350 (4/04)
Sale Price: In operation
Maintenance Cost: \$0.06/mile
Operating Cost: \$0.07/mile
Total Ownership Cost: \$0.23/mile

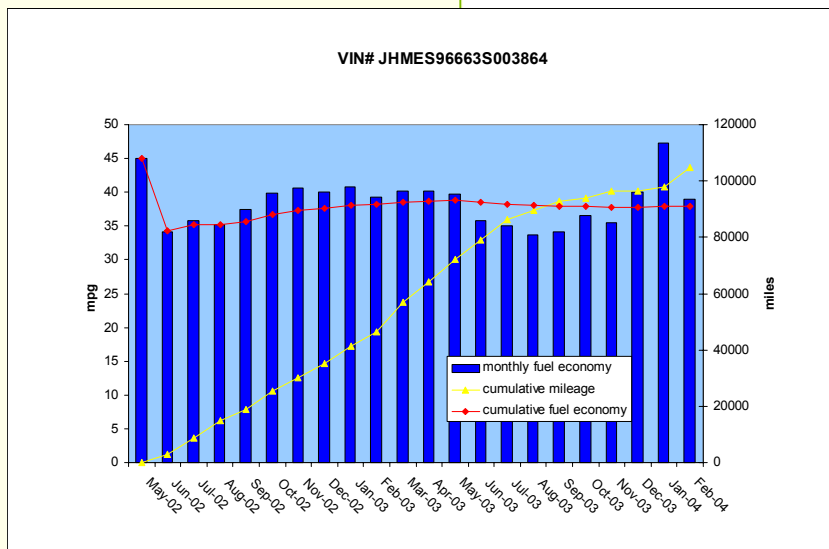
Operating Performance:

Total miles driven: 104,593
Cumulative MPG: 37.99

Vehicle Specifications

Engine: 4-cylinder, 70 kW @ 5700 rpm
Electric Motor: 10 kW
Battery: Nickel Metal Hydride
Seatbelt Positions: Five
Payload: 882 lbs
Features: Regenerative Braking
CVT Transmission

See HEVAmerica Baseline Performance Fact Sheet for more information.



* Purchase includes dealer price with options plus taxes. It does not include title, license, registration, extended warranty or delivery fee costs.



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