

ETA-NAC003

Revision 2

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Preparation and Issuance of Test Reports

Prepared by

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1.0 Objective

The objective of this procedure is to identify the proper methods for the preparation of reports during and subsequent to testing activities. These methods are not meant to supersede those of the testing facility, nor of any regulatory agency who may have or exercise control over the covered activities.

2.0 Purpose

This procedure identifies acceptable methods for the development, use, completion and retention of reports prepared in support of performance testing of electric vehicles provided to Electric Transportation Applications for testing to the technical requirements of NEV America.

3.0 Documentation

Documentation addressed by this procedure shall be consistent, easy to understand, easy to read, and readily reproducible. Reports shall contain enough information to "stand alone;" that is, they shall be self-contained to the extent that all individuals expected to review it could be reasonably expected to reach a common conclusion, without the need to review additional documentation. Review and approval of test documentation shall be in accordance with ETA-NAC004, "Review and Approval of Test Results." Storage and retention of records during and following testing activities shall be completed as described in Procedure ETA-NAC001, "Control, Close-out and Storage of Documentation."

4.0 Initial Conditions And Prerequisites

- 4.1 All relevant testing activities for the subject vehicle have been completed (as described in ETA-NAC002, "Control of Test Conduct") prior to the report being formally issued.
- 4.2 All necessary test documentation has been completed, reviewed and approved per the requirements of ETA-NAC004, "Review of Test Results," prior to the report being issued.
- 4.3 The method for distribution of the subject Report(s) shall be agreed upon prior to any report being formally issued.
- 4.4 Personnel who prepare Test Report(s) shall be familiar with the contents of this procedure as required by procedure ETA-NAC005, "Training and Certification Requirements for Personnel Utilizing ETA Procedures."

5.0 Activity Requirements

A Test Report shall be issued for any vehicle submitted to Electric Transportation Applications for testing, regardless of whether the vehicle is actually tested. Test Reports should be issued within 30 days of the completion of testing. In no case shall any report be issued more than 90 days after the completion of that vehicle's testing. This section provides additional requirements for the formal Test Report.

- 5.1 Test Reports shall be the preferred mechanism for the objective reporting of data collected during the NEV America Performance Test Program.
- 5.2 These reports may utilize a variety of media and formats, including text, data file, graphical depiction, film/video tape and oral presentation.
- 5.3 The material for each vehicle shall be presented in a stand-alone format.
- 5.4 Data/test results shall not be provided in a comparative format. That is, each vehicle's data shall be presented independent of the data of other tested vehicles.
- 5.5 The Test Report shall include the following:
 - 5.5.1 A Table of Contents
 - 5.5.2 An Executive Summary
 - 5.5.2.1 Vehicle description
 - 5.5.2.2 Test summary
 - 5.5.2.3 Summary Data Sheet (Appendix A)
 - 5.5.3 Test Program Summary
 - 5.5.3.1 Objectives
 - 5.5.3.2 Guidelines
 - 5.5.3.3 Administrative Controls
 - 5.5.3.4 Test Procedures
 - 5.5.3.5 Test Facilities
 - 5.5.3.6 Test Instrumentation
 - 5.5.3.7 Quality Assurance
 - 5.5.3.8 Test Sequence
 - 5.5.3.9 Test Exception Reports (ETA-NAC002 Appendix A)
 - 5.5.3.10 Non-Conformance Reprints

- 5.5.4 Vehicle Description
 - 5.5.4.1 Vehicle inspections sheets
 - ETA-NAC006 Appendix B
 - ETA-NTP011 Appendix A
 - 5.5.4.2 Vehicle supplier submittals required by Vehicle Technical Specification Appendix A
 - 5.5.4.3 Appendices/Submittals
 - Vehicle Technical Specification Appendix A
 - Vehicle Technical Specification Appendix B
- 5.5.5 Test Results (one section for each Test Procedure) containing:
 - 5.5.5.1 Test summary
 - 5.5.5.2 All test procedure data sheets
 - 5.5.5.3 Test Results Review check-sheet
 - 5.5.5.4 Graphical results presentation (charts, graphs, plots, etc.)
- 5.5.6 Appendices
 - 5.5.6.1 Appendix 1 - Vehicle photographs
 - 5.5.6.2 Appendix 2 - Supplier's correspondence
 - 5.5.6.3 Appendix 3 - Test Manager's Log
 - 5.5.6.4 Appendix 4 - Charge Log (ETA-NTP008 Appendix A)
- 5.5.7 Exhibits
 - 5.5.7.1 NEV America Vehicle Technical Specifications applicable to the testing activities.
- 5.6 The Test Report shall include any exceptions or deviations from the NEV America Vehicle Technical Specification taken by the vehicle supplier.
- 5.7 The Test Report shall not be provided/made available to the vehicle supplier for comment, prior to its issuance except as noted in 5.9.
- 5.8 Test Reports should not contain raw data sheets.
- 5.9 Test Reports shall include a Summary Data Sheet in the format shown in Appendix A. The Summary Data Sheet shall be provided to the vehicle supplier prior to issuance of the Test Report.

- 5.10 At least one representative of each organization involved in testing activities shall sign the Test Report(s). This signature indicates their organization's concurrence with the data contained in the Test Report. At a minimum, the Test Report for each vehicle shall be signed by the Test Manager.
- 5.11 Following completion, the Test Report shall be provided to the vehicle supplier, the U.S. Department of Energy (if co-funding the testing) and to the manufacturer of the vehicle (if different than the vehicle supplier and authorized by the vehicle supplier).
- 5.12 All original test documents, including data sheets and files, shall be incorporated into the Test Report maintained by Electric Transportation Applications in accordance with ETA-NAC001, "Control, Close-out and Storage of Documentation."

6.0 Glossary

- 6.1 Comment Sheet - A form used to record the comments of test personnel during the conduct of performance tests.
- 6.2 Effective Date - The first date that a procedure may be used to formally direct an activity or collect data. This date shall always be subsequent to the dated approval signature.
- 6.3 ETA - Electric Transportation Applications
- 6.4 Program Manager - As used in this procedure, the individual within Electric Transportation Applications responsible for oversight of the NEV America Performance Test Program. [Subcontract organizations may have similarly titled individuals, but they are not addressed by this procedure.]
- 6.5 Shall - Items which require adherence without deviation. Shall statements identify binding requirements. A go, no-go criterion.
- 6.6 Should - Items which require adherence if at all possible. Should statements identify preferred conditions.
- 6.7 Summary Data Sheet - A stylized presentation of test results in the form shown in ETTA-NTP003 Revision 1, Appendix A.
- 6.8 Test Director's Log - A daily diary kept by the Test Director, Program Manager, Test Manager or Test Engineer to document major activities and decisions that occur during the conduct of a Performance Test Evaluation Program. This log is normally a running commentary, utilizing timed and dated entries to document the days activities. This log is edited to develop the Daily Test Log published with the final report for each vehicle.

- 6.9 Test Director - The individual within Electric Transportation Applications responsible for all testing activities associated with the NEV America Performance Test Program.
- 6.10 Test Engineer - The individual(s) assigned responsibility for the conduct of any given test. [Each contractor/subcontractor should have at least one individual filling this position. If so, they shall be responsible for adhering to the requirements of this procedure.]
- 6.11 Test Manager - The individual within Electric Transportation Applications responsible for the implementation of the test program for any given vehicle(s) being evaluated to the requirements of the NEV America Performance Test Program. [Subcontract organizations may have similarly titled individuals, but they are not addressed by this procedure.]
- 6.12 Test Report - Final documentation of the results of testing prepared in accordance with ETA-NAC003.

7.0 References

- 7.1 ETA-NAC001 - "Control, Close-out and Storage of Documentation"
- 7.2 ETA-NAC002 - "Procedure for the Control of Test Conduct"
- 7.3 ETA-NAC004 - "Procedure for the Review of Test Results"
- 7.4 ETA-NAC005 - "Training and Certification Requirements for Personnel Utilizing ETA Procedures"
- 7.5 ETA-NAC006 - "Vehicle Verification"
- 7.6 ETA-NTP011 - "Receipt Inspection"
- 7.7 NEV America Vehicle Technical Specifications
- 7.8 Code of Federal Regulations, Title 10, Part 571, "Federal Motor Vehicle Safety Standards"

APPENDIX-A

Summary Data Sheet



NEVAmerica
US DOE ADVANCED VEHICLE TESTING ACTIVITY

PERFORMANCE STATISTICS



**2005 Global Electric Motorcars
e2 2-Passenger**

VEHICLE SPECIFICATIONS

<p>PURPOSE-BUILT VEHICLE Base Vehicle: 2005 Global Electric Motorcars e2 2-Passenger VIN: SASAG27485F035000 Seatbelt Positions: Two Standard Features: Front Wheel Drive Four Wheel Hydraulic Brakes Regenerative Braking With Coast Down and Over Speed Control Three-Point Safety Belts Speedometer Odometer State-Of-Charge Meter* Back-up Alarm Traction Control On Board Battery Charger</p> <p>BATTERY Manufacturer: GEM/Deka Type: 8031 Gel Number of Modules: 6 Weight of Module(s): 32.5 kg Weight of Pack(s): 195.0 kg Pack(s) Location: Under Seat Nominal Module Voltage: 12V Nominal System Voltage: 72V Nominal Capacity (C/20): 80 Ah</p>	<p>WEIGHTS Design Curb Weight: 1078 lbs Delivered Curb Weight: 1300 lbs Distribution F/R: 49/51 % GVWR: 1850 lbs GAWR F/R: 1023/1317 lbs Payload: 547 lbs Performance Goal: \geq 400 lbs</p> <p>DIMENSIONS Wheelbase: 72.2 inches Track F/R: 46.7/45.3 inches Length: 89.6 inches Width: 57.3 inches Height: 70.0 inches Ground Clearance: $>$ 5.0 inches Performance Goal: \geq 5.0 inches</p> <p>CHARGER Location: On-board Type: Conductive Input Voltages: 115/230 VAC</p> <p>TIRES Tire Mfg: Nankang Tire Model: NY361 Tire Size: 165/70R12* Tire Pressure: 35 psi Spare Installed: No</p>
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Acceleration (0-20 mph) @ 332 lbs Payload
At 100% SOC: 4.9 seconds
At 50% SOC: 5.6 seconds
Performance Goal: 6.0 seconds

Maximum Speed @ 170 lbs Payload
(FMVSS 49 CFR 571.500 5.5.a)
At 100%: 23.2 mph
Performance Goal: \leq 25 mph

Maximum Speed @ 332 lbs Payload
At 100% SOC: 23.8 mph
At 50% SOC: 24.0 mph

At Maximum Speed Range*
Range: 44.3 miles
Energy Used: 4.22 kWh
Efficiency: 95.2 Wh/mile
Specific Energy: 21.6 Wh/kg

Braking From 20 mph
Controlled Dry: 34 feet
Controlled Wet: 33.4 feet
Panic Wet: 27.7 feet
Course Deviation: 0.0 feet

Handling
Average time: 80.6 seconds
Average NEV Time*: 78.4 seconds

Gradeability (Calculated)
Maximum Speed @ 3%: 21.8 mph
Maximum Speed @ 6%: 19.6 mph
Maximum Grade: 30 %

Charging Efficiency:
Efficiency: 184 Wh-AC/mi
Energy Cost: @ \$0.10/kWh: \$0.0184/mi

Charger
Max Ground Current: 3 mA
Max Battery Leakage: 0.025 MIU
Max DC Charge Current: 12.51 A
Max AC Charge Current: 9.59 A
Peak Demand: 1009 W
Time to Recharge: 6 hours 52 minutes
Performance Goal: 12 hours

TEST NOTES:

- Vehicle was operated at maximum allowable speed until 16 mph could no longer be maintained.
- SOC Meter accuracy did not meet NEVAmerica performance goal. When the charger is unplugged prematurely, the SOC meter resets to 100%. Production modifications were incorporated by the manufacturer to resolve the issue (NCH NTPS 1-3003-005).
- As delivered payload was reduced to 347 lbs due to the optional equipment installed.
- The 165/70R12 tire is offered as an optional upgrade for the e2. The standard tire size is a 20.5/50-100R 10" tall tire.
- Pough Road testing showed new battery shifting, causing battery life to overlap. This issue was resolved in the production assembly process.
- Average handling time was determined by comparing 14 NEVs that have been tested in the NEVAmerica Program.

*This vehicle meets all EV America Minimum Requirements Based on track.
Values in red indicate the Performance Goal was not met. * All Power and Energy Values are DC unless otherwise specified.

APPENDIX-A

Summary Data Sheet

This vehicle complies with mandatory requirements of NEV America Vehicle Technical Specification, Revision 1 as follows.

- (1) Vehicles shall comply with Federal Motor Vehicle Safety Standard 500 as promulgated on the date of manufacture. Such compliance shall be certified by the Supplier in accordance with 49 CFR 567.
- (2) Suppliers shall provide a completed copy of Appendix A and Appendix B with their proposal providing vehicle specifications and the method of compliance, if any, with each listed section of 49 CFR 571.100.
- (3) Vehicles shall be certifiable under current California Air Resources Board (CARB) regulations as vehicles that meet ZEV emission requirements and qualify for ZEV credits. If the vehicle is equipped with a fuel-fired heater, the heater shall also comply with this requirement.
- (4) Suppliers shall provide Material Safety Data Sheets (MSDS) for all unique hazardous materials supplied with the vehicle.
- (5) Suppliers shall provide recycling plans for batteries and other vehicle hazardous materials including how the plan has been implemented.
- (6) All vehicles shall comply with the FCC requirements for unintentional emitted electromagnetic radiation, as identified in 47 CFR 15, Subpart B, "Unintentional Radiators."
- (7) Vehicles shall have a minimum payload of at least 400 pounds.
- (8) Suppliers shall provide the curb weight and rated payloads of their vehicles.
- (9) For conversion vehicles, Suppliers shall specify the OEM's gross vehicle weight rating (GVWR) and shall not exceed such rating.
- (10) For conversions, OEM Gross Vehicle Axle Weight Ratings (GAWR) shall not be increased.
- (11) Suppliers shall provide axle weights for the vehicle as delivered, and at full rated payload.
- (12) Odometers shall be provided as standard equipment or as an option and shall have an accuracy of at least $\pm 5\%$.
- (13) The Supplier shall offer a standard or an optional tire conforming to the following requirements:
 - Tires provided shall correspond to the requirements of the placard installed in accordance with 49 CFR 571.109, and 110, as applicable,
 - Suppliers shall specify manufacturer, model and size of the standard tire for the vehicle and for the tire provided,
 - Tire size and inflation pressure for the tire provided shall be in accordance with the requirements of the placard,
 - At no time shall the tire's inflation pressure exceed the maximum pressure molded into that tire's sidewall,
 - The tire provided shall be operable across the entire operation/load range of that vehicle,
 - Replacements for the tire provided shall be commercially available to the end user in sufficient quantities to support the purchaser's needs, and
 - Tires provided as original equipment by the Supplier shall not have warranty restrictions in excess of those of the tire's manufacturer, unless the Supplier provides the warranty for the tires.
- (14) Seating capacity shall be a minimum of 1 driver. Suppliers shall specify seating capacity (available seat belt positions) for their vehicle. If a conversion vehicle's seating capacity is changed from that specified by the OEM on their FMVSS placard, the seat(s) being added or abandoned shall be modified as required by 49 CFR 571.207, et al, and a new FMVSS placard installed as required by 49 CFR 567, 568 or 571, as applicable.
- (15) For conversion vehicles, the OEM passenger space shall not be intruded upon by the batteries or other conversion materials.
- (16) The controller/inverter shall limit the maximum battery discharge to prevent degradation of battery life (see Section 6.3) and loss of vehicle operability or shall indicate to the vehicle operator that the battery will be damaged by continued vehicle operation. Such limit and/or indication shall be repeatable and accurate to at least 10% battery state of charge.
- (17) Regenerative braking shall not adversely impact the vehicle's service brake capability on varying road surfaces.
- (18) Vehicles shall comply with the requirements of 49 CFR 571.105.S5.2.1, or alternatively, 49 CFR 571.105.S5.2.2 for parking mechanisms.
- (19) The vehicle top speed shall not exceed 25 mph when tested in accordance with 49 CFR 571.500.
- (20) Vehicles shall be capable of completing the NEV America Handling Test NTP-004 Revision 1 and Rough Road Test NTP-005 Revision 1 including (1) driving through two (2) inches of standing water at a speed of 20 mph without damage and without battery to chassis leakage current exceeding 0.5 MIU per UL Standard 2202, and (2) standing for extended periods in extreme temperatures without damage to or failure of the vehicle or its systems. Vehicles should be capable of completing the NEV America Rough Road Test NTP-005 Revision 1 without becoming inoperable.
- (21) Vehicle shall be capable of completing all NEV America tests without repairs exceeding a cumulative total of 72 hours.
- (22) If vehicle batteries require active ventilation for charging, the vehicle shall be so marked.
- (23) Suppliers shall indicate the depth of discharge below which the batteries should not be discharged.
- (24) Suppliers shall provide a description of areas of non-compliance (if any) with the requirements of Section 6.5.
- (25) Concentrations of explosive gases in the battery box shall not be allowed to exceed 25% of the LEL (Lower Explosive Limit).
- (26) Suppliers shall describe how battery boxes will be vented, to prevent battery gas accumulation during and following normal charging, abnormal charging and operation of the vehicle.
- (27) Suppliers shall provide a description of areas of non-compliance (if any) with the requirements of SAE J1718 on Battery Gas Evolution.
- (28) Maintenance requirements for the batteries shall be described and any associated cost(s) to the consumer/end user should be clearly defined.
- (29) Vehicles shall not contain exposed conductors, terminals, contact blocks or devices of any type that create the potential for personnel to be exposed to 60 volts or greater (the distinction between low-voltage and high voltage, as specified in SAE J1127, J1128, et al).
- (30) Access to any high voltage components shall require the removal of at least one bolt, screw, cover or latch.
- (31) Devices considered to be high voltage components shall be clearly marked as HIGH VOLTAGE.
- (32) Cable and wire marking shall consist of orange wire and/or orange sleeves as identified in SAE J1127.
- (33) Propulsion power system operating at greater than 60 volts shall be isolated from the vehicle chassis such that leakage current does not exceed 0.5 MIU.
- (34) Charging circuits shall be isolated from the vehicle chassis such that ground current from the grounded chassis does not exceed 5 mA at any time the vehicle is connected to an off-board power supply and shall be compatible with operation using a 5 mA GFCI.
- (35) Vehicles using HIGH VOLTAGE traction systems shall be equipped with a key operated "master" switch that shall interlock controller propulsion functions and battery contactor(s), if any, to render the propulsion system inoperative. Contactor(s) used in conjunction with the master switch shall be capable of interrupting maximum rated controller/inverter current.
- (36) A manual service disconnect for vehicles using a HIGH VOLTAGE traction system shall also be required. It shall have the following characteristics:
 - Manual action is required to break the connection,
 - The disconnection is physically verifiable,
 - The disconnection does not create exposed conductors capable of becoming energized while exposed, and
 - The service disconnect is marked so as to be visible from outside the vehicle with the doors (if so equipped) open and is accessible without the use of tools.
- (37) The following controller/inverter interlocks shall be present:
 - The controller shall not initially energize to move the vehicle with the direction selector in any position other than "PARK" or "NEUTRAL,"
 - The master switch key shall be removable only when the switch is in the "OFF" position, and
 - With a pre-existing accelerator input, the controller shall not energize such that the vehicle can move under its own power in this condition.
- (38) The vehicle shall be prevented from being driven with the master switch key turned on and the drive selector in the drive or reverse position while the vehicle's charge cord is attached.
- (39) Electrically powered windshield wipers shall be provided as standard or optional equipment.
- (40) An electrically powered warning horn operable by the vehicle driver shall be provided as standard or optional equipment.
- (41) Vehicles shall be equipped with an on-board or off-board battery charger capable of recharging the propulsion battery to a state of full charge from any possible state of discharge in less than 12 hours.
- (42) The charger shall be fully automatic, determining when "end of charge" conditions are met and transitioning into a mode that maintains the propulsion battery at a full state of charge while not overcharging it, if continuously left on charge.
- (43) On-board and off-board chargers shall have the capability of accepting input voltages of 120V (Level 1), 208V or 240V (Level 2) single phase 60 Hertz alternating current service, with a tolerance of $\pm 10\%$ of rated voltage.
- (44) On-board charger personnel protection systems, which may include ground fault circuit interrupters (GFCI), shall be in accordance with the provisions of UL Standards 2202.
- (45) Level 2 charge connector shall comply with the requirements of UL Proposed Standard 2251.
- (46) Regardless of the charger type used, the charger shall conform to the requirements of UL Proposed Standard 2202.
- (47) Suppliers shall specify all optional equipment required to meet the requirements of this Vehicle Specification.
- (48) Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics.

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