FORD MOTOR COMPANY

APPLICATION FOR CERTIFICATION – PART 1

2021 Model Year

Test Group: MFMXV00.0B4A
Durability Group: MFMXEEVNNG1C
Evap. Family: N/A

Test Group Description: LDV

Durability Group Description: Battery Electric

Application Standards: Federal: Tier 3 Bin 0
California: ZEV

Car Line Covered MUSTANG MACH-E AWD ER

Vehicle Tested:

Range Test Vehicle MGW1-0.0-J-078 Config. 00	
Charge Depleting UDDS TN:	MFMX10066219
Charge Depleting Highway TN:	MFMX10066220

Application Release Date: December 7, 2020

For Questions, Contact:
Reid Cuddy, rcuddy@ford.com (313-805-3619)

Part 1. Application Index

0. Cover Page

1. Reserved

2. Confidential Information

2.1 Statement of Confidentiality

2.2 Test Vehicle Selection

2.2.1 Weights

2.2.2 Test Parameters

2.3 Projected Sales

3. Facilities, Equipment and Test Procedures

3.1 Procedure to Determine Mass Emissions of Fuel Fired Heater

3.2 Battery and Vehicle Pre-Conditioning Procedures

4. Reserved

5. Reserved

6. Maintenance

6.1 Test Vehicle Scheduled Maintenance

6.2 Recommended Customer Maintenance Schedule

7. Labels

7.1 Label Locations

7.2 Statement of Compliance

8. General Technical Description

8.1 Description of Propulsion System

8.2 Description of Motor

8.3 Description of Battery

8.3.1 Battery Charging Capacity

8.3.2 Self Discharge Information

8.3.3 Description of Thermal Management System

8.3.4 Description of End of Life

8.3.5 Description of Battery Disposal Plan

8.4 Description of Controller/Inverter

8.5 Description of Transmission

8.6 Description of Climate Control System

8.7 Description of Regenerative Braking System

8.7.1 Control Logic

8.8 Description of Charger
8.8.1 Power Recharging Procedures
8.8.2 Power Requirements Necessary to Recharge Vehicle
8.9 Accessories Which Draw Energy from the Battery
8.10 Other Unique Features
8.11 Description of Warning Systems for Maintenance / Malfunction
8.11.1 Cut-off Terminal Voltages for Prevention of Battery Damage

9. Reserved

10. Reserved

11. Starting and Shifting Schedules

11.1 Starting Procedure
11.2 Shifting Schedule

12. Description of Vehicles Covered by Certificate

12.1 Calibration Parts List
12.2 Vehicle Description Report

13. Reserved

14. Request for Certification

15. Other Information

15.1 Fee Filing Form

16. Test Results

16.1 EPA Certification Summary Information Report (CSI)

17. California Requirements

17.1 Statement of Compliance
17.1.1 General Statement
17.1.2 Drivability Statement
17.2 Supplemental Data and Certification Review Sheet
17.2.1 Urban Test Results
17.2.2 Highway Test Results
17.2.3 Combined Results
17.2.4 Additional Supplemental Data
17.3 Reserved
17.4 Credits
17.4.1 Description of multi-manufacturer arrangements
17.4.2 Credit Calculation
17.5 Vehicle Safety
17.5.1 All Information for Safe Operation of Vehicle
17.5.2 Information on Safe Handling of Battery System
17.5.3 Description of Emergency Procedures

18. Application Revisions

3. Facilities, Equipment and Test Procedures

The facilities and equipment comply with the related regulations, including 40 CFR Subpart B, §86.108-00(b)(2) [Oct. 22, 1996]

Equipment:	48 inch, single roll electric dynamometer
Regenerative Braking:	Enabled
Vehicle & Battery break in Period:	2600 mile accumulated on this vehicle / battery before test.
Range Test Procedure:	Tested according to “California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light Duty Truck and Medium-Duty Vehicle Classes”, which was adopted on December 17, 2008.
Test Procedure Used:	Tested using the Multi Cycle Test (MCT) sequence as stated in SAE International’s “*Surface Vehicle Recommended Practice*” J1634 Oct. 2012.

3.1 Procedure to Determine Mass Emissions of Fuel Fired Heater

Not applicable since Fuel Fired Heater not offered for this vehicle by Ford.

3.2 Battery and Vehicle Pre-Conditioning Procedures

The HV battery and vehicle does not require any pre-conditioning to enable the vehicle system. However, Ford decided to have the test vehicle accumulated 2600 miles on proving ground track prior to testing.

4 Reserved

5 Reserved

6 Maintenance

6.1 Test Vehicle Scheduled Maintenance

Not applicable (same as “Recommended Customer Maintenance Schedule” found in next section).

6.2 Recommended Customer Maintenance Schedule

Ford’s recommended maintenance schedule can be found in the owners guide.

7 Labels

7.1 Label Locations and Labels

The Vehicle Emissions Control Information label (VECI) is located on the underside of the hood. See attachment for this vehicle's VECI label.

The Fuel Economy Label is installed on the passenger side front door. The Monroney Label now includes the EPA/DOT Fuel Economy and Environment Section (GHG, Smog Rating) based on the template published by EPA in May 2011. See attachment for label template to be used for this vehicle (The real FE label for this vehicle is not available at this time). The California Environmental Performance Label will be included on the vehicle. Please see section 17.2.3 for values.

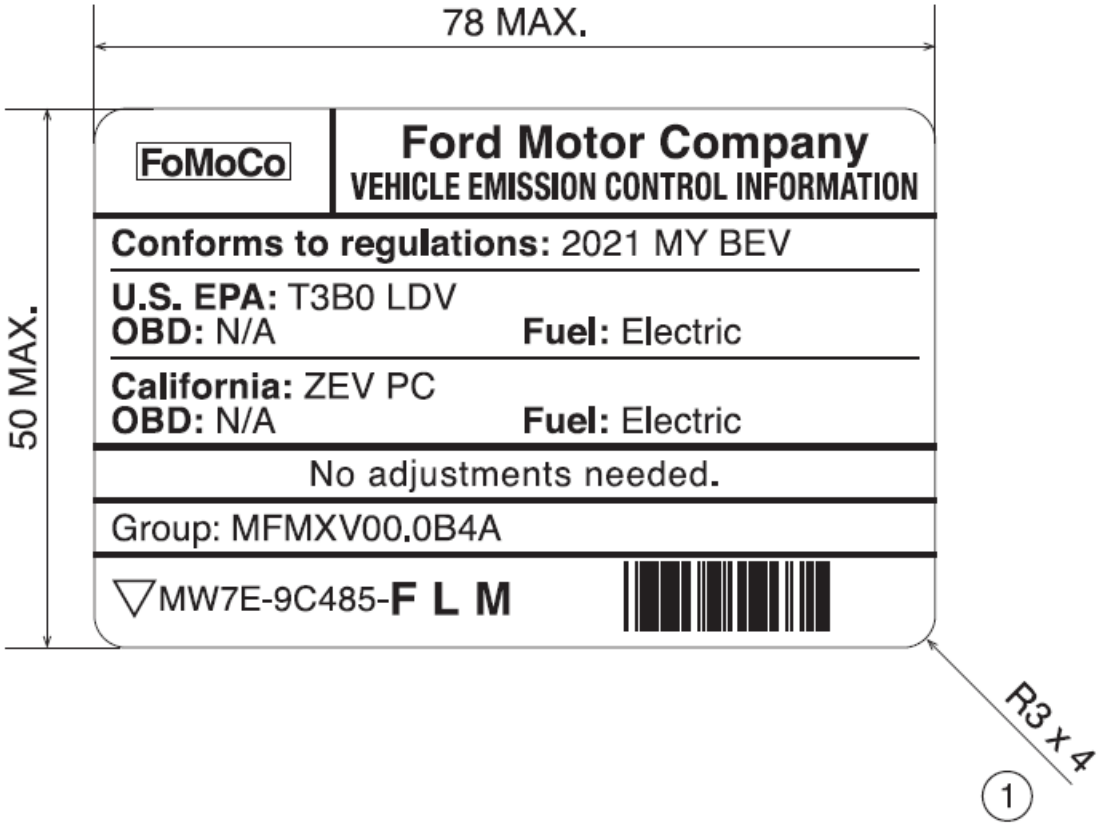
7.2 Statement of Compliance

This vehicle conforms to US EPA Tier 3 Bin 0 vehicle regulations applicable to 2018 model year new motor vehicles and to California regulations applicable to 2018 model year new ZEV light-duty vehicles.

MFMXV00.0B4A

50 State VECI LABEL

Ford Battery Electric Vehicle



8 General Technical Description

8.1 Description of Propulsion System

The propulsion system consists of an electric motor, motor controller, gearbox and the battery pack.

8.2 Description of Motor

Motor Type:	AC permanent magnet synchronous machine
Electric Engine Power (peak) [kW/hp]:	258kW/346HP

8.3 Description of Battery

Battery Type: Lithium Ion

Battery Capacity [Ah]: 288

Maximum Battery Voltage [V]: 404

Battery Weight [kg]: 596

Battery Specific Energy [Whr/kg, using C3 procedure]: 166

8.3.1 Battery Charging Capacity

Time for full re-charge:

Level 1 (120V/15A) = 95.1 hrs

Level 2 (240/48A) = 10.7 hrs

8.3.2 Self Discharge Information

Expected maximum: <1 % per month

8.3.3 Description of Thermal Management System

The thermal management system for the battery is a liquid cooled system, in which coolant is circulated through a chiller and the battery using a pump in order to cool the battery as it rises in temperature. The chiller is a refrigerant to coolant heat exchanger. While on plug in colder temperatures, an inline heater is used in the coolant system to heat the battery coolant which in turn heats the battery system for improved battery performance in cold weather.

8.3.4 Description of End of Life

The battery is designed to last 8 years, 100K miles (length of warranty provided but is not described as the End of Life)

8.3.5 Description of Battery Disposal Plan

Ford is a member of the End of Life Vehicle Solutions Corporation (ELVS), which was created by the automotive industry to promote the industry's environmental efforts in recyclability, education, outreach, and the proper management of substances of concern. ELVS has implemented a call center to provide guidance on the safe removal, transport and recycling of the batteries to dismantlers. ELVS is in the process of investigating a recovery and recycling process in which the dismantler would remove the battery from the vehicle, identify the battery type, and ship the battery to a battery recycling facility.

8.4 Description of Controller/Inverter

The propulsion system consists of an electric motor, motor controller, gearbox and the battery pack.

8.5 Description of Transmission

The transmission is a single ratio gearbox with an overall ratio of 9.05:1. The transmission gears are in constant engagement with no clutches. There is no shift indicator light since there is no shifting of gears. The overall ratio is 109 rev per mile.

8.6 Description of Climate Control System

A/C Compressor: Max working capacity 7.1 kW.

Heater: Max working capacity in 5.2kW.

8.7 Description of Regenerative Braking System

8.7.1 Control Logic

The vehicle is equipped with a regenerative braking system in which the regenerative braking energy is captured and stored back into the battery pack when decelerating. This regenerative braking system is enabled only when the vehicle is in motion when lifting off the accelerator pedal or pressing the brake pedal while the accelerator pedal is not pressed.

8.8 Description of Charger

The charger is capable of charging at 2 different rate:

Level 1: 120V/15A approximately 95.1 hrs for a full re-charge

Level 2: 240V/48A approximately 10.7 hrs for a full re-charge

Level 3: Up to 150kW DC fast-charging

8.8.1 Power Recharging Procedures

A. Power down the vehicle and put it in park (P). Press the indention located on the charge port door and the door will rotate open.

B. Plug the charger into the charge port and ensure that the teeth on the end of the charger plug have completely engaged. Verify that the cord acknowledgement feature activates, which indicates the beginning of a normal charge cycle.

C. Follow the charging station instruction to begin charging process. Allow 3-4 hours to completely charge the high voltage battery using 240V charging station. Using the standard 120V convenience cord will result in longer charging time.

D. When the charging indication light shows charging complete, turn off the charging station and remove the charging plug.

Please refer to owner's guide for additional instructions.

8.8.2 Power Requirements Necessary to Recharge Vehicle

Level 1: 120V/12A

Level 2: 240V/32A

8.9 Accessories Which Draw Energy from the Battery

The electric air conditioning system as well as the electric heater used for the passenger compartment heater both draw energy from the battery, however they can only draw energy from the battery when the vehicle is operating. In addition to passenger compartment heating/cooling, a liquid thermal management system draws energy to thermally condition the battery while the vehicle is operating or on-plug (while on-plug this system utilizes facility power instead of drawing energy form the battery). All other 12V systems (lights, radio, wipers etc.) also draw energy from the battery when the vehicle is on and in those cases, the higher voltage from the battery is converted via the onboard DCDC converter to approximately 14VDC in order provide the energy for those systems to operate.

8.10 Other Unique Features

There are no other unique features.

8.11 Description of Warning Systems for Maintenance/Malfunction

There are warning lights on the instrument cluster to inform the driver of any malfunctions. A trained service person can connect Ford's diagnostic tool to diagnose any malfunctions.

There are separate warning lights for the following:

A. Powertrain Malfunction/Reduced Power
   a. Wrench stating "Service Soon"
   b. Red Triangle stating "Stop Safely Now"

B. Motor Coolant Overheat
C. Anti-Lock Brake System
D. Stability Control System
E. High Voltage Battery Low or Depleted
F. Low Tire Pressure Warning

Detailed descriptions of the warning lights can be found in the owners guide.

8.11.1 Cut-off Terminal Voltages for Prevention of Battery Damage

Contactor opens when voltage is below 188V or above 414V.

9 Reserved

10 Reserved

11 Starting and Shifting Schedules

11.1 Starting Procedure

Please refer to Owner’s Guide for starting procedure.

11.2 Shifting Schedule

This vehicle uses an automatic shifter as in a conventional automatic transmission vehicle (move lever to “D” for Drive or “R” for Reverse) and since the vehicle uses a single ratio gearbox, there is no shift schedule.

12 Description of Vehicles Covered by Certificate

12.1 Calibration Parts List

Cert. Level	Calibrations	PCM -12A650-	HPCM -7P120-	BECM -10B687-	BCCM -10B689-	ABS -2D335-	Date
Initial Application	MCGWEJNC10	MJ98-GF	LJ98-DF	LJ98-BD	LJ98-AH	LJ9C-AG	8/24/2020

HV Battery Assembly: LJ98-10B759-AA

PDU (Primary Drive Unit): LJ9P-7P500-AA

SDU (Secondary Drive Unit): LJ9P-7B000-AC

Note:

12.2 Vehicle Description Report

See page attached.

Vehicle Description Report

Application: 50 ST

Test Group: MFMXV00.0B4A

ID Number	5713910
Displacement	0.1
Calibration	MCGWEJNC10
Fuel Tank(s)	
Carline	MACH-E AWD ER
Wheel Configuration	Standard
Body Style	4 DOOR SEDAN
Wheelbase	Base
Trans Code Combo	WA
Drive	AWD
Curb Weight	4838
ETW	5250
Loaded Weight - LVW	5138
ALVW - ETW	5250
Adj. Loaded Weight	5319
GVWR	5800
Min Axle Ratio	9.05
Max Axle Ratio	9.05
Min N/V Ratio	109.2
Max N/V Ratio	109.4
Emissions Vehicle Class	PC
Drive Code	PART-TIME 4-WHEEL
Trans Type	AUTOMATIC
Calibration Application	50ST
Min Tire Size	225/55R19 - 109.4
Max Tire Size	225/55R19 - 109.2
Alt Tire 1	
Alt Tire 2	
Alt Tire 3	
Alt Tire 4	
Alt Tire 5	
Alt Tire 6	
Alt Tire 7	
DAW Full Tank	2474
DAW Empty Tank	2474

13 Reserved

14 Request for Certificate

DocuSign Envelope ID: 80F392BD-96E5-4297-8180-90431F40A625

Vehicle Environmental Engineering
Ford Motor Company

Allen Park Test Laboratory
1500 Enterprise Drive, Suite 3W-200
Allen Park, Michigan 48101-2053

September 2, 2020

Mr. Tristin Rojeck
Certification Division
Mobile Source Pollution Control
U. S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, Michigan 48105

Dear Mr. Rojeck:

Ford Motor Company (Ford) herewith submits its Part I Application for Certification for 2021 model year battery electric-powered light-duty vehicles (LDVs) contained in Ford's 50 states test group MFMXV00.0B4A.

This Test Group complies with EPA final Tier 3 Bin 0 certification and in-use exhaust emission standards. Evaporative emission is not applicable to BEV program.

Based on Ford Motor Company's good engineering judgment, all the vehicles described in this application are designed to comply with the applicable intermediate and full useful life standards. Please note that Ford is currently investigating its process for characterizing road load force specifications, and it is possible that road load specification information may be revised as a result of the investigation. As of the date of this signature, I certify that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the prepared information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained in this document used in the development of the road load force specifications is, to the best of my knowledge and belief, true, accurate, and complete.

This Part I application for certification has been prepared in accordance with the standardized format recommended by EPA via its mail out # CD-14-19 (LDV/LDT/ICI/LIMO), subject: "Certification Application Reporting Guidance", dated November 24, 2014. Therefore, in accordance with the provisions of 40 CFR 86.1844-01(d)(14) including the provisions of 40 CFR Parts 85, 86 and 600, Ford requests that a Certificate of Conformity be issued for the LDV test group listed in this Application for Certification.

DocuSign Envelope ID: 80F392BD-96E5-4297-8180-90431F40A625

Please contact Reid Cuddy at 313-805-3619 or rcuddy@ford.com, if you have any questions regarding this submission.

Sincerely,

Glen Heiser

Glen Heiser, Manager
Car and Truck Certification
Certification Programs

DocuSign Envelope ID: 80F392BD-96E5-4297-8180-90431F40A625

Vehicle Environmental Engineering
Ford Motor Company

Allen Park Test Laboratory
1500 Enterprise Drive, Suite 3W200
Allen Park, Michigan 48101- 2053

September 2, 2020

Mr. Allen Lyons, Chief
Emissions Compliance, Automotive Regulations and Science Division
Air Resources Board
9480 Telstar Avenue, Suite 4
El Monte, California 91731

Dear Mr. Lyons:

Ford Motor Company (Ford) herewith submits an Application for Certification for 2021 model year battery electric-powered passenger cars (PCs) contained in Ford's 50 states test group MFMXV00.0B4A.

This Test Group complies with CARB ZEV emissions standards. Evaporative emission is not applicable to BEV program.

Based on Ford Motor Company's good engineering judgment, all the vehicles described in this application are designed to comply with the applicable intermediate and full useful life standards. Please note that Ford is currently investigating its process for characterizing road load force specifications, and it is possible that road load specification information may be revised as a result of the investigation. As of the date of this signature, I certify that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the prepared information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained in this document used in the development of the road load force specifications is, to the best of my knowledge and belief, true, accurate, and complete.

This Part I application for certification has been prepared in accordance with the standardized format recommended by EPA via its mail out # CD-14-19 (LDV/LDT/ICI/LIMO), subject: "Certification Application Reporting Guidance", dated November 24, 2014. This Application has also been prepared in accordance with the California Air Resources Board, Final Regulation Order, Amendments to Sections 1960.1, 1960.5, 1961, and 1962 Title 13, California Code of Regulations (As Amended August 4, 2005). Therefore, in accordance with the provisions of 40 CFR 86.1844-01(d)(14) including the provisions of 40 CFR Parts 85, 86 and 600, Ford requests that an Executive Order be issued for the PC test group listed in this Application for Certification.

DocuSign Envelope ID: 80F392BD-96E5-4297-8180-90431F40A625

Please contact Reid Cuddy at 313-805-3619 or rcuddy@ford.com, if you have any questions regarding this submission.

Sincerely,

Glen Heiser

Glen Heiser, Manager
Car and Truck Certification
Certification Programs

cc M. Rahman
J. Ng

15 Other Information

15.1 Fee Filing Form

US EPA Fee Form

General Information

Date:	06/30/2020
Process Code:	Submit New Filing Fee Form
Manufacturer Code:	FMX
Manufacturer Name:	Ford Motor Company

Manufacturer Contact

Name:	Tina Oliver
Email Address:	toliver@ford.com
Phone:	3133228938
Calendar Year complete application submitted to EPA:	2020
Engine Family / Evaporative Family / Test Group:	MFMXV00.0B4A

Certificate Request Type (Industry Sector Code)

- (●) On-Highway LDV, LTD, MDVPV, HDV Chassis Cert (Federal) (A, B, D, J, T, V)
- ( ) On-Highway HDE Dyno Cert (Federal) (E, H)
- ( ) On-Highway LD ICI, MDPV ICI, HDV ICI (A, B, D, J, T, V)
- ( ) On-Highway Motorcycle (C)
- ( ) On-Highway HDV Evap (F)
- ( ) On-Highway LDV, LTD, MDVPV, HDV Chassis Cert (California-Only) (A, B, D, J, T, V)
- ( ) On-Highway HDE Dyno Cert (California-Only) (E, H)
- ( ) Nonroad CI (L)
- ( ) Nonroad SI (B, S)
- ( ) Locomotive (G, K)
- ( ) All Nonroad Recreational, excluding Marine engines (X, Y)
- ( ) All Marine (Including IMO) (M, N, W)
- ( ) Component Certification for Evaporative Emissions (P)

IMO Name (Required for dual US/IMO Marine Only):	
ICI VIN Number (Required for ICIs Only):	
Do you qualify for a Reduced Fee (RF)?	
What is the total number of vehicles, engines, or units covered?:	
What is the aggregate total retail value of the vehicles, engines or units covered?:	

Payment Information

Amount Owed:	27,347.00
Payment Type:	Offline ACH

Comments:

26PAMU6S rpc

EPA Form Number 3520-29

OMB Control No. 2060-0545

Approval expires 12/31/2019

The public reporting and recordkeeping burden for this collection of information is estimated to average 20 minutes per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

EPA Form Number 3520-29

OMB Control No. 2060-0545

Approval expires 12/31/2019

The public reporting and recordkeeping burden for this collection of information is estimated to average 20 minutes per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

16 Test Results

16.1 EPA Certification Summary Information Report (CSI)

Certification Summary Information Report

Manufacturer	Ford Motor Company	**Manufacturer Code**	FMX
Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--
Certificate Number	--	**CARB Executive Order #**	--
Certificate Issue Date	--	**Certificate Revision Date**	--
Certificate Effective Date	--	**Conditional Certificate**	--
CSI Revision #	--	**CSI Submission/Revision Date**	09/01/2020 08:21:56 AM
Model Year	2021		

Test Group Information

CSI Type	Update for Correction	**Running Change Reference Number**	--
GHG Exempt Status	Not Exempt		

Drive Sources and Fuel(s)

Drive Source #1: Electric Motor

Fuel	Basic Fuel Metering System	Lean Burn Strategy Indicator
Electricity	--	No

Hybrid Indicator	No		
Multiple Fuel Storage	--	**Rechargeable Energy Storage System Indicator**	Yes
Multiple Fuel Combustion	--	**Off-board Charge Capable Indicator**	Yes
Fuel Cell Indicator	No	**EPA Vehicle Class**	LDV
Federal Clean Fuel Vehicle	No	**Federal Clean Fuel Vehicle Standard**	--
Federal Clean Fuel Vehicle ILEV	--	**California Partial Zero Emissions Vehicle Indicator**	--
Durability Group Name	MFMXEEVNNG1C	**Durability Group Equivalency Factor**	1.0
Reduced Fee Test Group	No	**Certification Region Code(s)**	FA, CA
Complies with HD GHG 2b/3 regulations?	No		
Introduction into Commerce Date	--	**CAP2000 Conditional Certificate?**	N/A
Independent Commercial Importer?	--	**Alternative Fuel Converter Certificate?**	--
SFTP Federal Composite Compliance Identifier	Not Applicable	**SFTP Tier 2 Composite CO Option**	--
SFTP LEV-III Composite Compliance Indicator	No		
OBD Compliance Type	CARB	**OBD Demonstration Vehicle Test Group**	MFMXT02.53CE
Test Group OBD Compliance Level	Full - no deficiencies	**Number of Test Group OBD Deficiencies**	0
OBD Deficiencies Comments	This BEV program does not have OBD compliance requirements. Items filled in for the purpose of passing system validation because they are required fields.		
Mfr Test Group Comments	2021MY Mach-E AWD BEV - Extended Range		
Mfr Exhaust / Evap Standards Comments	--		

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Models Covered by this Certificate

Carline Manufacturer	Division	Carline	Certification Region Code(s)	Drive System	Trans - Type	- # of Gears	Trans - Lockup
Ford Motor Company	1 - Ford	22 - MUSTANG MACH-E AWD EXTENDED	California + CAA Section 177 states	All Wheel Drive	Automatic	1	Yes
Ford Motor Company	1 - Ford	22 - MUSTANG MACH-E AWD EXTENDED	Federal	All Wheel Drive	Automatic	1	Yes

Engine Description

Hybrid Type	--	**Hybrid Description**	--
Engine Type	--	**Mfr Engine Description**	--
Engine Block Arrangement	--	**Mfr Engine Block Arrangement Description**	--
Camless Valvetrain Indicator	--	**Oil Viscosity/Classification**	
Number of Cylinders/Rotors	--	**Mechanically Variable Compression Ratio Indicator**	--

After Treatment Device(s) (ATD)

Mfr After Treatment Device (ATD) Comments	--
Direct Ozone Reduction (DOR) Device	--
Mfr Emission Control Device Comments	--

Official Test Numbers

Test Group Fuel	FTP	US06	SC03	Cold CO	Highway	EPA City Litmus Value	EPA City Litmus Threshold	EPA Highway Litmus Value	EPA Highway Litmus Threshold	CREE Weighting Factor
Electricity	--	--	--	--	--	--	--	--	--	--

Official Charge Depleting Test Numbers

Test Group Fuel	UDDS	Highway
Electricity	MFMX10066219	MFMX10066220

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Hybrid Electric Vehicle And Fuel Cell Information

Rechargable Energy Storage System	Battery(s)	**Rechargable Energy Storage System, if Other**	--
Battery Type	Lithium Ion	**Number of Battery Packs**	1
Total Voltage of Battery Packs	404	**Battery Energy Capacity**	288
Battery Specific Energy	166	**Battery Charger Type**	On-Board
Number of Capacitors	--	**Capacitor Rating (In Farads)**	--
Mfr Capacitor Comments	--		
Hydraulic System Description	--		
Regenerative Braking Type	Electrical Regen Brake		
Regenerative Braking Source	Both	**Driver Controlled Regenerative Braking**	No
Mfr Regenerative Braking Description	--		
Drive Motor(s)/Generator(s)	2		
Motor/Generator Type 1	AC permanent magnet synchronou	**Rated Motor/Generator Power**	209
Motor/Generator Type 2	AC permanent magnet synchronou	**Rated Motor/Generator Power**	49
Mfr Fuel Cell Description	--		
Fuel Cell On-Board H2 Storage Capacity (kg)	--	**Usable H2 Fill Capacity (kg)**	--
Mfr Hybrid Electric/ Electric Vehicle Comments	This is a pure BEV vehicle. The Drive Motors are both AC permanent magnet synchronous machines.		

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Emission Data Vehicle Information

Vehicle ID / Configuration	MGW1-0.0-J-078 / 0	**Manufacturer Vehicle Configuration Number**	0
Original Test Group Name	MFMXV00.0B4A	**Original Evaporative/Refueling Family**	--
Original Test Vehicle Model Year	2021		

Vehicle Model

Represented Test Vehicle Make	Ford	**Represented Test Vehicle Model**	Mach-E

Leak Family Details

Leak Family Identifier	--	**Leak Family Name**	--

Drive Sources and Fuel System Details

Drive Source and Fuel#	Drive Source	Fuel
1	Electric Motor	Electricity

Hybrid Indicator	No		
Multiple Fuel Storage	--	**Multiple Fuel Combustion**	--
Fuel Cell Indicator	No	**Rechargeable Energy Storage System Indicator**	Yes
Rechargeable Energy Storage System	Battery(s)	**Rechargeable Energy Storage System, if 'Other'**	--
Off-board charge Capable Indicator	Yes		
Odometer Correction -- Initial	0	**Odometer Correction Factor**	1.03
Odometer Correction Sign	+ = System Miles is equal to (Test odometer reading * Correction factor) + Initial system miles		
Odometer Correction Units	Miles		
Engine Code	MCGWEJNC08	**Rated Horsepower**	346
Displacement (liters)	0.001		
Air Aspiration Method	Naturally Aspirated	**Air Aspiration Method, if 'Other'**	
Number of Air Aspiration Devices	0	**Air Aspiration Device Configuration**	--
Charge Air Cooler Type	--	**Drive Mode While Testing**	All Wheel Drive
Shift Indicator Light Usage	Not eqipped	**Aged Emission Components**	4,000 (mi)
Curb Weight (lbs)	4838	**Equivalent Test Weight (pounds)**	5250
GVWR (lbs)	5800	**N/V Ratio**	0
Axle Ratio	9.05		
Transmission Type	BEV	**# of Transmission Gears**	1
Transmission Lockup	No	**Creeper Gear**	No

Dynamometer Coefficients:

	Target Coefficients			Set Coefficients			
Coefficient Category	**A (lbf)**	**B (lbf/mph)**	**C (lbf/mph**2)**	**A (lbf)**	**B (lbf/mph)**	**C (lbf/mph**2)**	**EPA Calculated Total Road Load Horse Power for City/Highway/Evap Coefficients**
City/Highway/Evap	46.77	0.2604	0.02086	4.87	-0.0375	0.02126	14.9

Emission Control Device Comments ZEV vehicle, T3B0/ZEV

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--
Manufacturer Test Vehicle Comments	2021 MY Mach-E BEV 4P AWD		

Test #	**MFMX10066219**	**Test Procedure**	**81 - Charge Depleting UDDS**
Exhaust Test # for this Evap Test	--	**Test Fuel Type**	62 - Electricity
Test Date	07/29/2020	**Fuel**	Electricity
Fuel Batch ID	--	**Fuel Calibration Number**	--
Vehicle Class	LDV/Passenger Car	**DF Type**	Mfr. Assigned
Verify Test Lab ID	APTL		
E10 Evaporative Test Measurement Method	--		
Test Start Odometer Reading	2903	**Odometer Units**	M
4WD Test Dyno	Yes	**Diesel Adjustment Factor Usage**	--
State of Charge Delta	Yes		
Drive Cycle Speed Tolerance Criteria	Used Part 1066 (+/- 2.0 mph, +/- 1.0 sec)	**Road Speed Fan Usage**	Yes

PHEV/EV Charge Depleting Test Information

Recharge Event Voltage	240	**Recharge Event Energy (kiloWatt-hours)**	101.2
Charge Depleting Range (Calculated miles)	371.5	**Charge Depleting Range (Actual miles)**	371.5
All Electric Range Unadjusted (miles)	--	**Derived 5-Cycle Coefficient Model Year**	--
Equivalent All Electric Range (miles)	371.5		
Number of Charge Depleting Bags/Phases Conducted	1	**Transition Bag/Phase Number**	--

Charge Depleting Bag/Phase

Charge Depleting Bag/Phase #	Test Result/Emission Name	Unrounded Test Result
1	Carbon-Related Exhaust Emissions	0
2	Drive Trace Absolute Speed Change Rating	0.5
3	Drive Trace Energy Economy Rating	-0.2
4	Drive Trace Inertia Work Ratio Rating	0.62
5	Manufacturer Fuel Economy	123.6

Manufacturer Test Comments --

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	150,000 miles	Federal Tier 3 Bin 0	CREE	0	--	--	--	0	--	0	--	--
CA	150,000 miles	California ZEV	CREE	0	--	--	--	0	--	0	--	--

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Test #	**MFMX10066220**	**Test Procedure**	**84 - Charge Depleting Highway**
Exhaust Test # for this Evap Test	--	**Test Fuel Type**	62 - Electricity
Test Date	07/29/2020	**Fuel**	Electricity
Fuel Batch ID	--	**Fuel Calibration Number**	--
Vehicle Class	LDV/Passenger Car	**DF Type**	Mfr. Assigned
Verify Test Lab ID	APTL		
E10 Evaporative Test Measurement Method	--		
Test Start Odometer Reading	2903	**Odometer Units**	M
4WD Test Dyno	Yes	**Diesel Adjustment Factor Usage**	--
State of Charge Delta	Yes		
Drive Cycle Speed Tolerance Criteria	Used Part 1066 (+/- 2.0 mph, +/- 1.0 sec)	**Road Speed Fan Usage**	Yes

PHEV/EV Charge Depleting Test Information

Recharge Event Voltage	240	**Recharge Event Energy (kiloWatt-hours)**	101.2
Charge Depleting Range (Calculated miles)	338.9	**Charge Depleting Range (Actual miles)**	338.9
All Electric Range Unadjusted (miles)	--	**Derived 5-Cycle Coefficient Model Year**	--
Equivalent All Electric Range (miles)	338.9		
Number of Charge Depleting Bags/Phases Conducted	1	**Transition Bag/Phase Number**	--

Charge Depleting Bag/Phase

Charge Depleting Bag/Phase #	Test Result/Emission Name	Unrounded Test Result
1	Carbon-Related Exhaust Emissions	0
2	Drive Trace Absolute Speed Change Rating	1.81
3	Drive Trace Energy Economy Rating	0.43
4	Drive Trace Inertia Work Ratio Rating	2.41
5	Manufacturer Fuel Economy	112.8

Manufacturer Test Comments --

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	150,000 miles	Federal Tier 3 Bin 0	CREE	0	--	--	--	0	--	0	--	--
CA	150,000 miles	California ZEV	CREE	0	--	--	--	0	--	0	--	--

Fuel Properties

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Consolidated List of Standards

Exhaust Standards

Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	California ZEV
Fuel	Electricity	**Test Procedure**	Charge Depleting UDDS

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CREE	--	--	--	--	--	--	0	0

Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	California ZEV
Fuel	Electricity	**Test Procedure**	Cold CO

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CO	--	--	--	--	--	--	0	0

Cert Region	Federal	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	Federal Tier 3 Bin 0
Fuel	Electricity	**Test Procedure**	Charge Depleting UDDS

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CREE	--	--	--	--	--	--	0	0

Cert Region	Federal	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	Federal Tier 3 Bin 0
Fuel	Electricity	**Test Procedure**	Cold CO

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CO	--	--	--	--	--	--	0	0

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--
Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	California ZEV
Fuel	Electricity	**Test Procedure**	Charge Depleting Highway

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CREE	--	--	--	--	--	--	0	0

Cert Region	Federal	**Cert/In-Use Code**	Both
Vehicle Class	LDV/Passenger Car	**Standard Level**	Federal Tier 3 Bin 0
Fuel	Electricity	**Test Procedure**	Charge Depleting Highway

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
150,000 miles	CREE	--	--	--	--	--	--	0	0

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Glossary

Useful Life			
4	4,000 miles	120	120,000 miles
50	50,000 miles	150	150,000 miles
100	100,000 miles		

Emission Name			
HC-TOTAL	Total Hydrocarbon	METHANOL	CH3OH - Methanol
CO	Carbon Monoxide	N2O	Nitrous Oxide
CO2	Carbon dioxide	SPITBACK	Spitback Hydrocarbon in grams
CREE	Carbon-Related Exhaust Emissions	AMP-HRS	Integrated Amp-hours
OPT-CREE	Optional Carbon-Related Exhaust Emissions	START-SOC	System Start State of Charge Watt-hours
NOX	Nitrogen Oxide	END-SOC	System End State of Charge Watt-hours
PM	Particulate Matter	ACT-DISTANCE	Actual Distance Driven (miles)
PM-COMP	SFTP Composite Particulate Matter	AS-VOLT	Average System Voltage
HC-NM	Non-methane Hydrocarbon	CO2 BAG 1	Bag 1 Carbon Dioxide
OMHCE	Organic material Hydrocarbon Equivalent	CO2 BAG 2	Bag 2 Carbon Dioxide
OMNMHCE	Organic material non-methane HC equivalent	CO2 BAG 3	Bag 3 Carbon Dioxide
NMOG	Non-methane organic gases	CO2 BAG 4	Bag 4 Carbon Dioxide
HCHO	Formaldehyde	NMOG+NOX	Non-methane organic gases plus Nitrogen Oxides
H3C2HO	Acetaldehyde	NMOG+NOX-COMP	SFTP Composite Non-methane Organic Gases + Nitrogen Oxides
HC-NM+NOX	SFTP Non-methane Hydrocarbon + Nitrogen Oxides for US06 or SC03	DT-IWRR	Drive Trace Inertia Work Ratio Rating
HC-NM+NOX-COMP	SFTP Composite Non-methane Hydrocarbon + Nitrogen Oxides	DT-ASCR	Drive Trace Absolute Speed Change Rating
CO-COMP	SFTP Composite Carbon Monoxide	DT-EER	Drive Trace Energy Economy Rating
ETHANOL	C2H5OH - Ethanol	COMB-CREE	Combined Carbon-Related Exhaust Emissions
FE BAG 1	Bag 1 Fuel Economy	COMB-OPT-CREE	Combined Optional Carbon-Related Exhaust Emissions
FE BAG 2	Bag 2 Fuel Economy	HC-TOTAL-EQUIV	Total Hydrocarbon equivalent - Evap only
FE BAG 3	Bag 3 Fuel Economy	METHANE-COMB	Combined CH4 for HD 2b/3 vehicles only
FE BAG 4	Bag 4 Fuel Economy	N2O-COMB	Combined Nitrous Oxide for HD 2b/3 vehicles only
MFR FE	Manufacturer Fuel Economy	LEAK-DIA	Effective Leak Diameter (inches)
HC	Hydrocarbon for Running Loss and ORVR	LEAK-GAS CAP	Gas Cap Leakage (cc/min)
METHANE	CH4 - Methane	CO2-COMB	Combined Carbon Dioxide for HD 2b/3 Vehicles Only

Certification Region			
CA	California + CAA Section 177 states	FA	Federal

Exhaust Emission Standard Level			
B1	Federal Tier 2 Bin 1	L3ULEV340	California LEV-III ULEV340
B2	Federal Tier 2 Bin 2	L3ULEV250	California LEV-III ULEV250
B3	Federal Tier 2 Bin 3	L3ULEV200	California LEV-III ULEV200
B4	Federal Tier 2 Bin 4	L3SULEV170	California LEV-III SULEV170
B5	Federal Tier 2 Bin 5	L3SULEV150	California LEV-III SULEV150

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--
B6	Federal Tier 2 Bin 6	L3LEV630	California LEV-III LEV630
B7	Federal Tier 2 Bin 7	L3ULEV570	California LEV-III ULEV570
B8	Federal Tier 2 Bin 8	L3ULEV400	California LEV-III ULEV400
B9	Federal Tier 2 Bin 9	L3ULEV270	California LEV-III ULEV270
B10	Federal Tier 2 Bin 10	L3SULEV230	California LEV-III SULEV230
B11	Federal Tier 2 Bin 11	L3SULEV200	California LEV-III SULEV200
HDV1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000)	T3B160	Federal Tier 3 Bin 160
HDV2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000)	T3B125	Federal Tier 3 Bin 125
L2	California LEV-II LEV	T3B110	Federal Tier 3 Transitional Bin 110
L2OP	California LEV-II LEV Optional	T3B85	Federal Tier 3 Transitional Bin 85
U2	California LEV-II ULEV	T3SULEV30	Federal Tier 3 Transitional LEV-II SULEV30 Carryover
S2	California LEV-II SULEV	T3B70	Federal Tier 3 Bin 70
ZEV	California ZEV	T3B50	Federal Tier 3 Bin 50
OT	Other	T3B30	Federal Tier 3 Bin 30
T1	Federal Tier 1	T3B20	Federal Tier 3 Bin 20
PZEV	California PZEV	T3B0	Federal Tier 3 Bin 0
L2LEV160	California LEV-II LEV160	HDV2B395	Federal Tier 3 HD Class 2b Transitional Bin 395
L2ULEV125	California LEV-II ULEV125	HDV2B340	Federal Tier 3 HD Class 2b Transitional Bin 340
L2SULEV30	California LEV-II SULEV30	HDV2B250	Federal Tier 3 HD Class 2b Bin 250
L2LEV395	California LEV-II LEV395	HDV2B200	Federal Tier 3 HD Class 2b Bin 200
L2ULEV340	California LEV-II ULEV340	HDV2B170	Federal Tier 3 HD Class 2b Bin 170
L2LEV630	California LEV-II LEV630	HDV2B150	Federal Tier 3 HD Class 2b Bin 150
L2ULEV570	California LEV-II ULEV570	HDV2B0	Federal Tier 3 HD Class 2b Bin 0
L3LEV160	California LEV-III LEV160	HDV3B630	Federal Tier 3 HD Class 3 Transitional Bin 630
L3ULEV125	California LEV-III ULEV125	HDV3B570	Federal Tier 3 HD Class 3 Transitional Bin 570
L3ULEV70	California LEV-III ULEV70	HDV3B400	Federal Tier 3 HD Class 3 Bin 400
L3ULEV50	California LEV-III ULEV50	HDV3B270	Federal Tier 3 HD Class 3 Bin 270
L3SULEV30	California LEV-III SULEV30	HDV3B230	Federal Tier 3 HD Class 3 Bin 230
L3SULEV20	California LEV-III SULEV20	HDV3B200	Federal Tier 3 HD Class 3 Bin 200
L3LEV395	California LEV-III LEV395	HDV3B0	Federal Tier 3 HD Class 3 Bin 0

Transmission Type Code			
AMS	Automated Manual- Selectable (e.g. Automated Manual with paddles)	M	Manual
A	Automatic	OT	Other
AM	Automated Manual	SA	Semi-Automatic
CVT	Continuously Variable	SCV	Selectable Continuously Variable (e.g. CVT with paddles)

Drive System Code			
4	4-Wheel Drive	P	Part-time 4-Wheel Drive
F	2-Wheel Drive, Front	A	All Wheel Drive
R	2-Wheel Drive, Rear		

Certification Summary Information Report

Test Group	MFMXV00.0B4A	**Evaporative/Refueling Family**	--

Additional Terms and Acronyms

AFC	Alternative Fuel Converter	ICI	Independent Commercial Importer
CSI	Certificate Summary Information	ORVR	Onboard Refueling Vapor Recovery
DF	Deterioration Factor	SIL	Shift Indicator Light
Evap	Evaporation, Evaporative	Trans	Transmission

17 California Requirements

17.1 Statement of Compliance

17.1.1 General Statement

Ford Motor Company states that in regard to the vehicle control systems and all related parameters the production vehicles will be identical to the test vehicles which are used for certification testing.

17.1.2 Drivability Statement

The 2021 model year Ford Mustang Mach-E vehicles meet the typical drivability requirements that the United States market expects, including acceleration rates, braking performance and stability performance. Furthermore, this vehicle meets all applicable FMVSS standards.

17.2 Supplemental Data and Certification Review Sheet

17.2.1 Certification Review Sheet

See Attachment.

E.O.#.

2018 MY MODEL-YEAR AIR RESOURCES BOARD CERTIFICATION REVIEW SHEET ZEV-PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

Manufacturer: Ford Motor Company Test Group: MFMXV00.0B4A

Range Test Results								
		(check one)	(check one)			System	System	Vehicle
Vehicle ID	Trans	TW _____	DPA _____		Unadjusted Range	AC (Wh/mi)	DC (Wh/mi)	DC (Wh/mi)
		ETW / GVWR _X____	RLHP _____					
			dyno coeff. X					
MGW1-0.0-J-078	CVT	5250	F0 = 46.77	Ford UDDS Original Test	371.49	272.62	258.33	238.11
			F1 = 0.2604				246.50	
			F2 = 0.02086				230.32	
							236.15	
				Ford HWY Original Test	338.92	298.81	265.79	260.99
							256.18	

Battery Test Results: Specific Energy (Whr/kg) _170

Vehicle Models	Trans type	Calibration	ETW (lb)	Tires	TRLHP
Mustang Mach – E AWD ER	CVT (single speed)	MCGWEJNC08	5250	P225/55R19	14.9

Fuel Fired Heater Test Results (emission results in grams/mile): NA

NMHC
CO
NOx Remarks:

----------ARB USE ONLY ----------

Application Processed By: _____ Date:_____

Reviewed by: _____ Date: _____

17.3 Reserved

17.4 Credits

17.4.1 Description of multi-manufacturer arrangements

Not applicable to this program. Ford is the sole manufacturer of this product.

17.4.2 Credit Calculation

As per the California EPA ARB document: "California Exhaust Emissions Standards … for 2018 and Subsequent Model Zero-Emission Vehicles…", which was adopted in California on Mar 22, 2012, the 2021 model year Mustang Mach-E AWD ER BEV will receive 4 ZEV Credits for each vehicle sold, according to the following formula:
ZEV Credit =
(0.01)*(UDDS Range)+0.50 = (0.01)*(371)+0.50 = 4 Credits.

17.5 Vehicle Safety

17.5.1 All Information for Safe Operation of Vehicle

Details on how to operate the vehicle can be found in the owners guide.

Note that the vehicle is started and driven in the same manner as a conventional I.C.E. vehicle.

17.5.2 Information on Safe Handling of Battery System

The battery is to be serviced only by technicians that are authorized to do so by Ford. The detail will be available prior to production

17.5.3 Description of Emergency Procedures

Emergency procedures are described in Owner's guide. Please refer to owner's guide for details.

SECTION 18

Revisions