

Public ✓

OCT 21 1994

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

R. H. Munson, Executive Director  
Automotive Safety and Engineering Standards Office  
Ford Motor Company  
Fairlane Plaza South, Suite 400  
330 Town Center Drive  
Dearborn, MI 48126

NEF-111bdh  
94V-175

Dear Mr. Munson:

This acknowledges receipt of your Defect Information Report involving the battery design on certain Ford Motor Company (Ford) vehicles submitted in accordance with 49 CFR Part 573, "Defect and Noncompliance Reports."

**RECALL CAMPAIGN INFORMATION**

**NHTSA Recall Campaign ID Number:** 94V-175  
(Please refer to this number in all future correspondence.)

**NHTSA Contact:** Jonathan D. White, Chief  
Technical Analysis Branch

**Telephone:** (202) 366-5227  
**Fax:** (202) 366-7882

**Date of Letter:** August 24, 1994

**Number of Vehicles Recalled:** 34 Ford 1993 Ecostar model electric vehicles manufactured from August 1, 1993, through May 31, 1994.

**Defect:** There is a design problem on the battery used on these electric vehicles. An activated looping element reopened causing an increase in temperature due to the high resistance in the group of weak cells resulting in fire.

This recall campaign was the subject of a Preliminary Evaluation, PE94-047, conducted by the Office of Defects Investigation.

Ford is responsible for the remedy of these vehicles from this date forward, regardless of vehicle age, mileage, or ownership. You should know that the agency provides a listing of safety recalls to the media at the end of each month. This recall will be a part of that listing.

**ADDITIONAL INFORMATION REQUIRED**

In order for us to complete our file on this matter, please furnish the address and the name and title of the chief executive officer or knowledgeable representative of Asea Brown-Boveri.

Please provide this information, referencing the National Highway Traffic Safety Administration's identification codes on page 1 of this letter, to this office by **November 16, 1994.**

**QUARTERLY STATUS REPORTS**

It is our understanding that all vehicles have been retrieved. Please provide one quarterly report confirming that this recall campaign is 100 percent completed.

Sincerely,



Louis J. Brown, Jr., Acting Director  
Office of Defects Investigation  
Enforcement



84V-270 (1)

Robert H. Munson  
Executive Director  
Automotive Safety and Engineering Standards Office  
Environmental and Safety  
Engineering Staff

Ford Motor Company  
330 Town Center Drive  
Dearborn, Michigan 48126

August 24, 1994

William A. Boehly  
Associate Administrator for Enforcement  
National Highway Traffic Safety Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Dear Mr. Boehly:

NHTSA has expressed interest in the background of two incidents of sodium sulphur battery fires involving 1993 Ecostar electric vehicles being operated in field tests in California. As you know, Ford issued a public announcement about these incidents on June 3, 1994. This is to report that we and the supplier of the Ecostar batteries, Asea Brown-Boveri (ABB), have concluded our investigations. On the basis of the best information available, Ford Electric Vehicle Engineering and the supplier have determined that the two incidents were unrelated, having risen from different causal factors.

It was concluded that the first incident was caused by a reweld process used in the manufacture of a battery cell. This reweld was employed to replace a positive terminal on a previously filled and sealed battery cell. The weld energy likely fractured the cell's ceramic seals allowing sulfur to escape from the cell and corrode copper components within a nearby looping element. Despite warning indicators to the driver, continued vehicle operation led to the destruction of the battery. The battery manufacturer's records indicate that this is the only battery in the test fleet that was reworked in this manner. The second incident was found to have resulted from a malfunction of the internal fusing system of the battery. This was caused by a high resistance condition within a looping element that had previously activated to bypass a group of weak cells (The battery has 480 cells divided into 80 groups of 6 each, which are then connected together to form the total battery). Each looping element protects a group of cells and each group is fused for proper operation. A looping element will allow the battery to bypass a group of six cells if a problem is present within the group. If a problem occurs, the looping element, which is normally open, will close and the six cells will then be excluded from the total battery. Analysis of the failed battery determined that an activated looping element reopened causing an increase in temperature due to high resistance in the group of weak cells causing the fire. The most probable cause for an activated looping element to develop high resistance after months

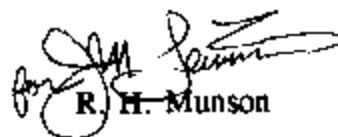


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of proper operation is motion of the looping element contacts due to thermal and/or mechanical stresses in the battery.

Ford first received information on May 2, 1994 that there had been a battery fire in one of the Ecostar vehicles, and our Electric Vehicle Engineering activity and ABB were able to determine relatively soon that the battery involved was one that had been subject to a rewelding process not employed in the manufacture of any other battery being used in the test fleet. When the second incident occurred on June 3, 1994, Ford requested that all vehicles be taken out of operation until further notice (Copies of the notice to Ecostar participants and the news release are attached). By June 6, 1994 all participants had been notified telephonically to return the leased vehicles to Ford while a complete investigation took place. Once a countermeasure strategy for the concern represented by the second incident is finalized, the vehicles will be appropriately modified and returned to the lessees. The countermeasure under development contemplates automatic cooling of any battery that exhibits excessive heat levels. Upon return to service, the close monitoring that has been a key part of the Ecostar experimental vehicle program to date will continue.

Very truly yours,

  
R. H. Munson

04V-177 ○

# IMMEDIATE ACTION REQUIRED

June 3, 1994

TO: ALL ECOSTAR PARTICIPANTS

IN ADDITION TO THE PHONE CALL MADE TO EACH ECOSTAR PARTICIPANT TODAY THE FOLLOWING INFORMATION IS PROVIDED.

AS THE RESULT OF A SECOND ECOSTAR FIRE THAT OCCURRED TODAY AT THE CALIFORNIA AIR RESOURCES BOARD PLEASE TAKE THE FOLLOWING PRECAUTIONARY MEASURES:

PARK ALL ECOSTARS OUTSIDE AND PLACE THEM ON EITHER NORMAL OR CONVENIENCE CHARGE. DO NOT DRIVE THE VEHICLES UNTIL DIRECTED OTHERWISE BY THE ECOSTAR PROGRAM OFFICE.

VERIFY THAT CHARGE HAS BEGUN, THEN PERIODICALLY MONITOR THE VEHICLES OVER THE WEEKEND. (AN HOURLY VISUAL CHECK IS RECOMMENDED).

PG 2

IF ANY VEHICLE EXHIBITS ANY WARNING LIGHTS CONTACT THE ECOSTAR HOTLINE IMMEDIATELY (800) 852-5280.

FORD WILL CONDUCT A CONFERENCE CALL MONDAY JUNE 6 AT 12:00 NOON EDT. TO JOIN THE CONFERENCE CALL PLEASE DIAL 800-382-9808, THEN DIAL ACCESS CODE 290849 AT THE PROMPT.

A NEWS RELEASE IS INCLUDED WITH THIS COMMUNICATION.

AS ADDITIONAL INFORMATION BECOMES AVAILABLE IT WILL BE COMMUNICATED TO YOU BY FAX.

*Bernard H. Ris*

BERNARD RIS

ECOSTAR PROGRAM MANAGER



**NEWS**

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Environmental & Safety

Public Affairs

Ford Motor Company  
The American Road  
Room 804  
Dearborn, Michigan 48121  
Telephone: (313) 322-8600  
Fax: (313) 323-8118

**IMMEDIATE RELEASE**

Contact: Pam Kueber  
(313) 337-2456

UW-111 (1)

## **FORD PARKS ITS ECOSTAR TEST FLEET TO INVESTIGATE BATTERY CONCERN**

DEARBORN, Mich., June 3 – Ford Motor Company today asked customers participating in its Ecostar electric vehicle test program to park their vehicles outdoors and refrain from using them while the company investigates the cause of an apparent second battery fire that occurred this morning.

The fire involved an Ecostar being tested by the California Air Resources Board at its El Monte, Calif., offices. The vehicle was parked and charging when the fire began at approximately 6:40 a.m. (PDT). No one was injured and no property, beyond the vehicle, was damaged. The local fire department was called to the scene and used water to extinguish the fire.

This incident was similar to one on May 2, when the battery in the Ecostar being leased by the Electric Power Research Institute (EPRI) in Palo Alto, Calif., caught fire. Ford and battery supplier ABB of Mississauga, Ont., began an immediate investigation.

Working with ABB, Ford initially determined that the battery cells involved in the earlier fire were built with a different production procedure and that no other battery in today's fleet employed cells built with the same production processes. As a result, Ford and ABB believed that the battery fire in the EPRI vehicle was an isolated incident. Extensive details about the ongoing investigation were and continue to be communicated to Ecostar customers.



However, because of this second occurrence, Ford has decided to suspend use of the vehicles until it understands, and can correct, the underlying cause of the problem. The company's investigatory team is working with ABB on both incidents.

Ford's EcoStar uses an advanced sodium-sulfur battery. It is the only advanced battery available so far for larger-scale fleet testing. To date, Ford has delivered a total of 34 of the electric vans to 12 customers nationwide. The fleet has accumulated more than 50,000 on-road miles.

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June 3, 1994



REC-1111



NOV -8 AM 11:06

OFFICE  
DEFECTS INVESTIGATION

Robert H. Munson  
Executive Director  
Automotive Safety and Engineering Standards Office  
Environmental and Safety  
Engineering Staff

Ford Motor Company  
350 Town Center Drive  
Dearborn, Michigan 48126

October 31, 1994

Mr. Louis J. Brown Jr., Acting Director  
Office of Defects Investigation  
National Highway Traffic Safety Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Dear Mr. Brown:

Subject: NHTSA Recall 94V-175 - NEF-111bdh

This is in response to the request for additional information contained in your letter dated October 21, 1994, regarding sodium-sulphur batteries in 1993 Ecostar electric vehicles. The Vice President and General Manager of Asea Brown-Boveri is Mr. Malcolm Shemmans, 7400 Pacific Circle, Mississauga, Ontario, Canada, L5T 2A4.

Sincerely,

*R. H. Munson for*  
R. H. Munson

## ODI RESUME

INVESTIGATION : PE94-047                      DATE CLOSED : 13 -SEP-1994

SUBJECT : Battery fires in Ford's electric Ecostar vans

PROMPTED BY : Ford Motor Company News Release

PRINCIPAL ENGINEER: Steve Chan

MANUFACTURER : Ford Motor Company

MODEL(S) : Ecostar (electric van)

MODEL YR(S) : 1993                              VEHICLE POPULATION: 34

SYNOPSIS: Two incidents were reported. In the first, during recharging, the sodium-sulfur battery caught fire due to an internal fusing system defect. In the second case, a reworked sodium-sulfur battery caught fire during vehicle operation.

### FAILURE REPORT SUMMARY

BASIS:	ODI	MANUFACTURER	TOTAL
COMPLAINTS:	0	NA	0
ACCIDENTS:	0	NA	0
INJ ACCID:	0	NA	0
# INJURIES:	0	NA	0
FAT ACCID:	0	NA	0
# FATALS:	0	NA	0
Fire:	0	2	2

ACTION: Recall 94V-175 was initiated by Ford on August 24, 1994. This PE is closed.

BRCH CHF Richard Boyd      DIV CHF Richard Boyd      OFC DIR [Signature]

9-23-94                      9-23-94                      9/23/94  
 DATE                              DATE                              DATE

SUMMARY: On June 3, 1994, Ford announced two incidents of battery fires involving 34 - 1993, model year experimental Ecostar electric vans. These vans use Sodium-Sulfur batteries with operating temperatures of 300-350 degree C. The first battery fire incident occurred on May 2, 1994, as the vehicle was being operated; the second incident occurred on June 3, 1994, during battery recharging. On June 16, 1994, PE94-047 was opened concerning the fire incidents.

Ford and ABB (the battery supplier) were able to determine that the first incident was caused by a reweld process used in the manufacturing of a battery cell. The weld energy likely fractured the cell's ceramic seals allowing sulfur to escape

11/23

from the cell. Despite warning indicators to the driver, continued vehicle operation led to the destruction of the battery.

The second incident was found to have resulted from a malfunction of the internal fusing system of the battery. The battery has 480 cells divided into 80 groups of 6 each, which are then connected together to form the total battery. Each group of cells is protected by a looping element that allow the battery to bypass a troubled group. If a problem occurs, the looping element, which is normally open, will close and the six cells will then be excluded (shorted out by the looping element) from the total battery. Analysis of the failed battery by Ford and ABB indicated that an activated looping element reopened causing an increase in battery temperature due to high resistance in the group of weak cells; the battery subsequently caught fire. Ford stated that the most probable cause for the failed looping element is thermal and/or mechanical stresses in the battery.

Based on the findings of the second battery fire incident, Ford initiated recall 94V-175. Ford is developing a countermeasure to detect and to prevent excessively high battery temperature. Once developed, the Ecostars electric vans will be appropriately modified and returned to the lessees.

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