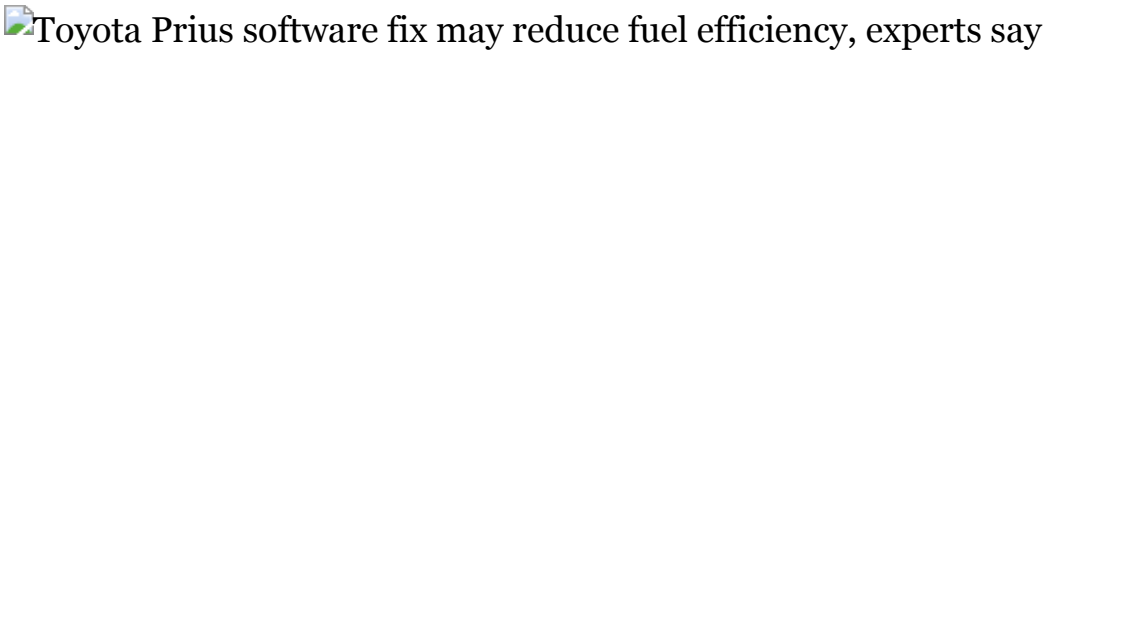
Toyota lied to consumers about Prius fuel efficiency, experts say

Ralph Vartabedian By RALPH VARTABEDIAN



About 800,000 Toyota Priuses were recalled in 2014 to address overheating. Some drivers and experts who studied Toyota documents say the company's software fix resulted in a reduction in fuel economy. (Joe Raedle / Getty Images)

When Robert Enger took his Toyota Prius into a dealership for a safety recall, he didn't expect that his fuel economy would drop.

Just six months after buying the new 2013 Prius, Enger learned that the company was recalling it to fix the car's hybrid electrical system, which was overheating and frying itself. A technician plugged the car into a diagnostic tool that installed new computer code in two electronic modules. That was supposed to fix the problem.

The repair itself has become controversial amid allegations that the electrical systems are still overheating after the software fix. But Enger noticed something else: His fuel economy dropped by 5 miles per gallon in city driving. Enger, an electrical engineer from Hermosa Beach, checks his mileage every fill-up, dividing the number of miles he drove since the last fill-up by the number of gallons he pumped to top off the tank.

About 800,000 Toyota Priuses in the U.S. were recalled in 2014 to address overheating that damages the car's inverter, a key part of the electrical power system. A lawsuit brought last year by one of Southern California's largest Toyota dealers asserted that the software fix did not solve the overheating problem and could lead to an abrupt loss of power. A related complaint by the dealer is now under review by the National Highway Traffic Safety Administration.

Academic experts contacted by The Times said it is likely the software change reduced the car's fuel efficiency. And a lawsuit this month in federal court makes allegation that Toyota "concealed from consumers that the software reflash decreased the fuel efficiency — defeating the very purpose of owning these hybrid vehicles."

A statement by Toyota did not directly address questions about whether fuel economy and emissions are affected, but said the company would defend itself against such allegations.

The company's documents show it modified not only software that controls the inverter's function, but also the software in the vehicle's powertrain control computer that determines how much power is supplied to the transmission by the gasoline engine and by the electric motors, according to the experts, hybrid vehicle engineers at major academic research centers.

The inverter, a device about the size of a large shoe box, boosts the battery's 200 volts to about 500 volts for the electric motors and converts the battery's direct current to alternating current (similar to what comes out of a household outlet). When the brakes are applied, the power flows in the other direction to charge the battery.

The change in the powertrain software and evidence of physical problems in the inverter probably shows that the company's modification reduced the power supplied by the battery and increased reliance on the Prius' four-cylinder gasoline engine, according to the academic experts who have reviewed those filings. If so, the car's fuel economy probably dropped and its emissions increased, they say.

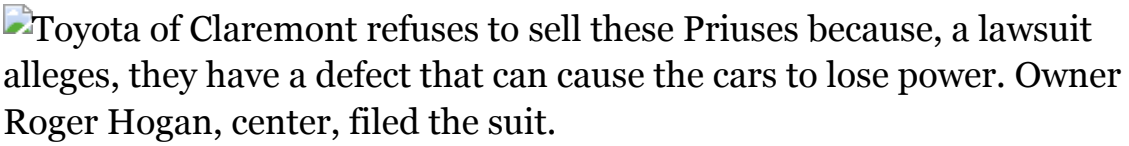
The Prius has an EPA fuel economy rating of 51 miles per gallon in city driving for the 2010 model and 49 mpg for the 2014 model. Enger said his city driving mileage dropped from 49 mpg before the software change to 44 mpg afterward.

Assertions that the Toyota software change decreased the car's fuel economy are contained in a lawsuit seeking class-action status filed this month in U.S. District Court in Los Angeles. "Unbeknownst to drivers, Toyota reduced the vehicles' fuel efficiency, which is the main reason why consumers purchase Priuses," it alleges. The suit by two Toyota owners, filed by Los Angeles attorney Skip Miller, contends that Toyota's inaccurate fuel efficiency claims violate various consumer protection laws and result in fraud, false advertising and breach of contract.

Roger Hogan, who owns two big Toyota dealerships in Southern California, has sued Toyota, alleging that more than 100 Priuses have come to his service departments with failed inverters after the software fix was made.

Hogan's suit said that Toyota was slow to notify owners of the defect. It said that the company waited several years to issue the recall for the

basic Prius after knowing about the problem and then waited another 18 months to extend the recall to the Prius V.


Toyota of Claremont refuses to sell these Priuses because, a lawsuit alleges, they have a defect that can cause the cars to lose power. Owner Roger Hogan, center, filed the suit.

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Toyota officials at the company's U.S. headquarters in Texas issued a statement disputing the allegations in the class-action suit, saying they are without merit. They previously said the Hogan suit is without merit.

"Toyota's focus remains on the safety and security of our customers, and we stand behind the effectiveness and appropriateness of the Prius inverter recall remedy," the statement said. "Due to the pending litigation, we cannot address the specific fuel economy claims in detail at this time, however, we intend to defend against them vigorously."

The company notified the California Air Resources Board of the software change in January 2014, saying that that it made "no significant difference on emissions and fuel economy," according to a board spokeswoman. NHTSA referred questions about the performance to the Environmental Protection Agency, which did not respond by the time of publication.

The Times interviewed more than a dozen Prius owners who described reliability and fuel consumption issues with their Priuses. When the inverter overheats, the car can suffer a total loss of power or enter what Toyota calls a "limp home mode." When it happens, the dashboard lights up with warnings.

Kathleen Ryan, a Marina del Rey Prius owner who got the software fix in 2014, was driving in the fast lane on the 91 Freeway in January, cruising along at 70 mph, when suddenly "it felt like somebody pulled the emergency brake."

The car slowed down to 15 mph and Ryan had to cross three lanes of high-speed traffic that was swerving around her slow car. Several California Highway Patrol Officers on the shoulder, who had stopped to deal with a stalled big rig, told her she was lucky to be alive, she said.

"If I had been in an accident, nobody would know how it happened," said Ryan. "They would say, 'Oh, this old lady doesn't know how to drive.' If somebody dies, we wouldn't even know how it happened."

Jason Levine, executive director of the Center for Auto Safety, said that a car in limp-home mode may be better than a full stall, but still puts drivers in a "freaky" situation. "You have gone to a large golf cart," he said.

Levine and others compare Toyota's software fixes to Apple's secret modification of software that controls the iPhone, slowing down the device as the battery ages and loses its ability to hold a full charge. The Securities and Exchange Commission and the Justice Department said in January they were launching investigations into Apple's practices.

In many cases, the inverters fail when drivers step hard on the accelerator or brake hard, which subjects the inverter to high loads. In its recall notice to owners, Toyota suggested drivers should temporarily take it easy on their Priuses: "Until the remedy is

performed, drivers should avoid placing a high load on the hybrid system by avoiding full throttle application when possible."

The company has been struggling with the overheating problem in the Prius as far back as May 2011, according to a "defect information report" that it filed with federal safety regulators in 2014. Its engineers examined the possibility that solder joints were cracking, a result of "excessive thermal stress."

In following years, engineers found cracks in the solder, but could not find a problem in its manufacturing process. Later, the report said, the cracks were not turning up in the wagon version of the vehicle, the Prius V, which has the same inverter. By 2014, Toyota finally settled on changing the software in the inverter and engine controller. It told federal regulators it would sent owners notices by 2015.

The overheating occurs in special electronic devices, known as "insulated gate bipolar transistors," or IGBTs, which boost voltage and convert the DC power from the battery to AC power.

Heath Hofmann, an electrical engineering professor at the University of Michigan and an expert in hybrid vehicle power systems, describes the transistors as high-power switches that turn on and off thousands of times per second. The auto industry is trying to find a substitute for the silicon transistors, but so far continues to use IGBTs. It is likely the transistor loads are at the heart of Toyota's problem, he said, based on the defect information reports.

"It strongly suggests that they did something to change the vehicle's overall power management system," Hofmann said after looking at some of the Toyota recall documents. "The likely thing they did was reduce the power running through the inverter and the motor generator, particularly if they are having problems in high power demand situations."

Michael Pecht, a University of Maryland professor who founded the school's Center for Advanced Life Cycle Engineering, which focuses on

electronics reliability, also reviewed the Toyota recall documents. "Clearly, they are saying the problem is in the IGBT, but they couldn't find the cause for two years," he said.

Pecht said the software fix to reduce temperatures in the inverters may help, but "it is just going to delay when the failure occurs. My gut is that the software fix saves money. This is really serious. The inverters need to be replaced."

In his lawsuit, Hogan alleges that replacing an inverter costs more than $2,000, while the software fix costs the manufacturer $80.

Hogan said a few Toyota owners have returned to his dealership, saying their Prius suffered a loss of fuel economy after the software fix. A few Prius owners contacted by The Times said they did not notice any change in their fuel economy. Other Prius owners have made the same complaint as Enger in Toyota chat rooms, saying it "detunes" their cars and increases the use of the gasoline engine.

In many cases, however, Prius owners may not know their fuel economy has degraded because they don't routinely check it or they may not associate it with the software recall.

Enger, the Hermosa Beach engineer, said he tried to get answers from his dealer and then finally called Toyota's customer service hotline. He said he wasn't able to get to the bottom of his problem with customer relations.

"It was like talking to a cat," he said.

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