



GENERAL MOTORS LLC  
Global Vehicle Safety

July 21, 2017

Mr. Gregory Magno, Chief  
Vehicle Defects Division – A  
Office of Defects Investigation  
National Highway Traffic Safety  
Administration  
1200 New Jersey Ave., SE, Room W48-334  
Washington, DC 20590

G210185

NEF-101  
RQ17-002

**Re: General Motors LLC's Responses to Information Requests 8 and 13 of NHTSA  
RQ17-002**

Dear Mr. Magno:

This letter contains General Motors LLC's ("GM") written responses to requests 8 and 13 in the National Highway Traffic Safety Administration's ("NHTSA") May 1, 2017 letter requesting information relating to its Recall Query investigation RQ17-002 (the "IR"). Unless otherwise defined below, GM's responses rely on the IR's defined terms.

GM's document production relating to the responses in this letter are contained on the enclosed compact disks titled ATT\_1\_GM, ATT\_2\_GM\_CONF and ATT\_3\_Dephi\_CONF.

GM's responses were compiled and prepared by this office upon review of the documents produced by various GM locations, and do not include documents generated or received at those GM locations subsequent to their searches. GM claims that certain information in documents that are part of lawsuit and claims files maintained by the GM Legal Staff is attorney work product and/or subject to the attorney-client privilege. That information includes notes, memos, reports, photographs, and evaluations by attorneys (and by consultants, claims analysts, investigators, and engineers working at the request of attorneys). GM is producing responsive documents from claims files that are neither attorney work product nor privileged, and withholding those that are attorney work product and/or privileged.

GM's responses are based on searches of GM locations where documents determined to be responsive to your request would ordinarily be found. As a result, the scope of GM's searches did not include, nor could they reasonably include, "all of its past and present officers and employees, whether assigned to its principal offices or any of its field or other locations, including all of its divisions, subsidiaries (whether or not incorporated) and affiliated enterprises and all of their headquarters, regional, zone and other offices and their employees, and all agents, contractors, consultants, attorneys and law firms and other persons engaged directly or indirectly (e.g., employee of a consultant) by or under the control of GM (including all business units and persons previously referred to), who are or, in or after 1995, were involved in any way with any of the following related to the alleged defect in the subject vehicles: a. Design, engineering, analysis, modification or production (e. g. quality control); b. Testing, assessment or evaluation; c.



Consideration, or recognition of potential or actual defects, reporting, record-keeping and information management, (e.g., complaints, field reports, warranty information, part sales), analysis, claims, or lawsuits; or d. Communication to, from or intended for zone representatives, fleets, dealers, or other field locations, including but not limited to people who have the capacity to obtain information from dealers.”

**REQUESTS AND RESPONSES**

**REQUEST 8:**

8. Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, “actions”) that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, GM. For each such action, provide the following information:

- a. Action title or identifier;
- b. The actual or planned start date;
- c. The actual or expected end date;
- d. Brief summary of the subject and objective of the action;
- e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and
- f. A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

**GM RESPONSE:**

The information listed in Table 8-1 below is a summary of actions that GM is aware of as of June 30, 2017 that are responsive to request 8. Documents and additional supporting information are included in the attachments as noted in the table.

<b><u>Action 8-A: GM Internal Investigation N=140291</u></b>	
<b>Start/End Dates</b>	January 2014 – November 18, 2014
<b>Involved Engineering Groups</b>	GM Global Safety and Field Investigations, GM Global Engineering, Delphi Automotive
<b>Description of Action</b>	In January 2014, GM began investigating claims that headlamp driver modules (“HDM”) in Buick LaCrosse vehicles could overheat and melt. GM analyzed NHTSA Vehicle Owner Questionnaires (“VOQs”), warranty data, TREAD data, and other data, and tested original equipment used HDM components.

	<p>In March 2014, GM recovered a melted HDM and underhood electrical center from the field. GM determined that the HDM was an aftermarket component that contained a unique three-pin field effect transistor (“FET”). From April through June 2014, GM purchased HDM components from various manufacturers and analyzed each for internal construction, FET type, and terminal-plating thickness.</p> <p>From July through November 2014, GM recovered and analyzed melted HDMs from Buick LaCrosse, Pontiac Grand Prix, and Chevrolet Trailblazer vehicles. Every melted HDM that GM recovered from the field was an aftermarket part that contained the three-pin FET.</p> <p>On August 7, 2014, NHTSA sent GM additional VOQs that related to simultaneous low-beam headlamp failure and melt incidents in the LaCrosse, Trailblazer, and Grand Prix. Having isolated the HDM-melt failure to an aftermarket part of unknown manufacture, GM changed the focus of its investigation to analyzing VOQs relating to simultaneous low-beam headlamp failure. After reviewing vehicle test results, warranty data, TREAD data, VOQs, and other data, GM identified several vehicles and build periods that had higher rates of HDM failure corresponding to intermittent or permanent loss of low-beam headlamps.</p>
<b>Outcome</b>	On November 18, 2014, GM’s Safety and Field Action Decision Authority (“SFADA”) reviewed the investigation and decided to commence the subject recall.
<b>Associated Documents</b>	Information and documents contained in GM’s GVS-CORE (Global Vehicle Safety-Case Observation Review & Evaluation) database related to investigation N-140291, including related and duplicate investigations. GM has produced these documents on the ATT_1_GM and ATT_2_GM_Conf disks in folder Q_08_A.
<b><u>Action 8-B: GM Internal Investigation N17-209191</u></b>	
<b>Start/End Dates</b>	March 3, 2017 – March 23, 2017
<b>Involved Engineering Groups</b>	GM Global Safety and Field Investigations, GM Global Engineering, Delphi Automotive
<b>Description of Action</b>	In March 2017, GM investigated allegations of HDM failures in subject vehicles that are not included in the subject recall population. GM’s investigation involved review and analysis of warranty data, NHTSA VOQs, and GM aftersales part-sales information.
<b>Outcome</b>	On March 23, 2017, SFADA decided to provide extended warranty coverage for certain MY 2006-2009 subject vehicles that were not included in the subject recall.

<b>Associated Documents</b>	Information and documents contained in GM's GVS-CORE database relating to investigation N17-209191. GM has produced these documents on the ATT_1_GM and ATT_2_GM_Conf disks in folder Q_08_B.
<b>Action 8-C: GM Engineering Studies</b>	
<b>Start/End Dates</b>	September 2014 – November 2016
<b>Involved Engineering Groups</b>	GM Engineering (Electrical Centers, Connectors, and Grommets Engineering)
<b>Description of Action</b>	The investigation involved on-vehicle tests with different samples of the suspect component to induce failures in the subject component, and component-level tests at the GM electrical development lab in Warren, MI to measure and evaluate part-temperature performance.
<b>Outcome</b>	This testing demonstrated that the subject component in certain applications of the subject vehicles may not operate properly in the thermal environment of the vehicle's underhood electrical center.
<b>Associated Documents</b>	Information, documents and emails related to these HDM studies and testing. GM has produced these documents on the ATT_1_GM and ATT_2_GM_Conf disks in folder Q_08_C.
<b>Action 8-D: Delphi Engineering Studies</b>	
<b>Start/End Dates</b>	April 2, 2014 – October 14, 2014
<b>Involved Engineering Groups</b>	Delphi Automotive Systems, LLC
<b>Description of Action</b>	Delphi Automotive Systems, LLC ("Delphi") conducted this investigation, which involved component-level evaluation in which the HDM was exposed to temperature extremes to define the upper shut-off limit, and design of experiment tests performed to measure the temperature on the PCB inside the HDM relay.
<b>Outcome</b>	The results of these tests augmented GM's test results demonstrating that the subject component in certain applications of the subject vehicles may not operate properly in the thermal environment of the vehicle's underhood electrical center.
<b>Associated Documents</b>	Delphi documents that GM has in its possession, custody, or control presented during GM meetings and reviews, and related emails. GM has produced these documents on the ATT_1_GM and ATT_3_DELPHI_Conf disks in folder Q_08_D.

TABLE 8-1: SUMMARY OF ACTIONS

**REQUEST 13:**

13. Furnish GM's assessment of the alleged defect in the subject vehicle models, including:

- a. The causal or contributory factor(s);
- b. The failure mechanism(s);
- c. The failure mode(s);
- d. The risk to motor vehicle safety that it poses;
- e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring or subject component was malfunctioning; and
- f. The reports included with this inquiry.

**GM RESPONSE:**

**A. Field incidents involving the loss of low beam headlamps and daytime running lights in the subject vehicles are generally attributable to one of two different root causes**

**1. Extended HDM exposure to higher operating temperatures**

The HDM in the subject vehicles is located inside the vehicle's underhood bussed electrical center, or UBEC. This HDM was designed to operate at an ambient temperature of 105 degrees Celsius (221 degrees Fahrenheit) without overheating. The temperature inside the UBEC can be affected by different vehicle design and operational factors, including, among other things, the electrical load in the HDM, the type of headlamp bulbs in the vehicle, and the heat generated by other UBEC components. These factors can, depending on the vehicle, cause the thermal environment inside the UBEC to exceed 105 degrees Celsius. Over time, higher-than-expected operating temperatures in the UBEC can damage the FET and solder joints inside the HDM, which can cause the HDM to fail.

GM's warranty data demonstrates that HDM failures relating to this condition are heavily concentrated in certain of the subject vehicles and in certain vehicle build windows (pink boxes approximate build windows included in the subject recall):

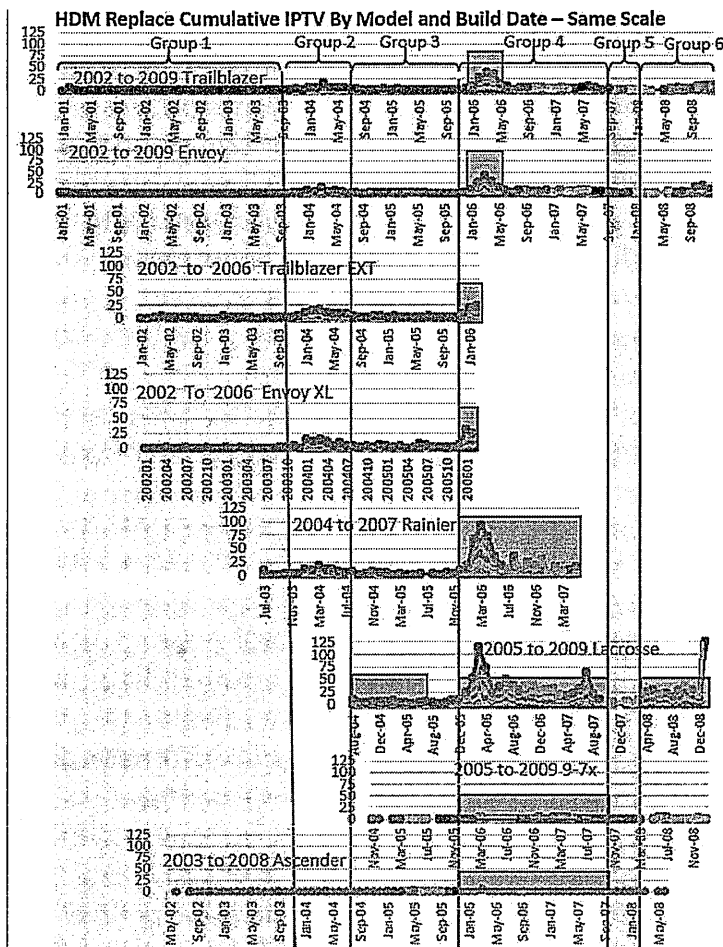


TABLE 13-1: WARRANTY RATES OF THE SUBJECT COMPONENT IN THE SUBJECT VEHICLES

If the HDM fails, the vehicle’s low beams and reduced intensity low beam daytime running lamps (“DRLs”) will no longer operate. The remaining lamps in the vehicle—high beams, marker lamps, turn signals, and fog lamps (if equipped)—will continue to function. The low beam lamps and DRLs may flicker or dim before the HDM fails, which can warn the vehicle’s operator that the vehicle’s headlamps require service before the HDM fails.

**2. Certain non-GM aftermarket HDMs use a defective design that can cause the HDM to short circuit and melt**

Through its Product Assistance Center, GM has received 11 melted HDMs from subject vehicles in the field that were sufficiently intact to permit meaningful inspection and analysis. All of these melted components were aftermarket HDMs, which GM believes were made by one specific manufacturer. While some of these parts were too damaged to fully analyze, the parts that GM could inspect and scan all: (i) were built between December 2010 and April 2013; (ii) are marked with the code “SH276”; and/or (iii) use a three-pin FET, unlike other aftermarket HDMs and the HDM installed as original equipment in the subject vehicles. This three-pin FET design, apparently used by third parties, is not GM validated or approved for use in the subject vehicles,

and can short circuit. If a short circuit occurs, the resulting heat can be sufficient to melt the HDM, the UBEC, and/or the attached wiring harness. After April 2013, the aftermarket part in question appears to have changed to a 7-pin FET. GM has not received any melted HDMs utilizing a 7-pin FET, and is not aware of any confirmed reports of 7-pin HDM parts melting in the field.

**B. GM defined the scope of the subject recall using field data**

On November 18, 2014, GM’s SFADA reviewed vehicle test results, warranty data, TREAD data, VOQs, and other data, and decided to conduct a safety-related recall on certain subject vehicles. As shown in Table 13-1 above, SFADA defined the scope of the subject recall based on the frequency of HDM failures in certain vehicle populations. As GM has received additional field data, GM has acted to expand the subject recall and extend special-warranty coverage to certain other potentially affected subject-vehicle populations. In August 2015, GM expanded the original recall by 159,584 vehicles. In March 2017, GM extended a 12 year/150,000 mile special warranty coverage to additional 777,640 vehicles.<sup>1</sup>

**C. The scope of the subject recall is currently properly defined**

GM believes that the subject recall is properly defined and that the subject vehicles not included in the subject recall do not contain a defect under the Safety Act. Given the widespread proliferation of poor quality, non-GM replacement HDMs in the aftermarket, certain types of field data—for example, consumer complaints to GM’s Customer Assistance Center and NHTSA VOQs—do not necessarily correlate to failures of the subject component in the field, and even less so to failures of the subject component during vehicle operation that led to a sudden loss of the vehicle’s low-beam headlamps.

As shown in the warranty chart in Table 13-1 above, warranty data enabled GM to exclude non-GM aftermarket components from its field-data analysis, and to identify and recall specific build periods in which the subject component, and only the subject component, was experiencing higher-than-expected failure rates in the field.<sup>2</sup> At present, GM believes that the warranty data supports the conclusion that the subject recall has adequately captured this population:

<b><u>Subject vehicles in the recall</u></b>	<b><u>Subject vehicles not in the recall</u></b>
427,643 vehicles 8,630 warranty claims for HDM failures <b>20.18 IPTV</b>	2,183,589 vehicles 7,612 warranty claims for HDM failures <b>3.49 IPTV</b>

TABLE 13-2: WARRANTY RATES OF THE SUBJECT COMPONENT IN RECALLED AND NONRECALLED SUBJECT VEHICLES

<sup>1</sup> The recall expansion and special coverage included both subject vehicles (as defined in the IR) and non-subject vehicles.

<sup>2</sup> The provided warranty data is, if anything, overinclusive, in that it reflects the replacement of the subject component for any reason, including for reasons unrelated to the defect at issue in the subject recall or the alleged defect. The actual warranty rate attributable to the defect at issue in the subject recall is likely lower than the rates provided in Tables 13-1 and 13-2.

The unrecalled subject vehicle population is large (over 2.1 million vehicles) and has been in the field between 9 and 16 years. Despite significant field exposure, GM is aware of only a handful of cases in which an HDM may have failed in a nonrecalled subject vehicle in a way that may have caused a crash, and GM believes that all of these incidents were minor in nature:

- GM is aware of only seven crashes and four injuries in the unrecalled vehicle population that are related to allegations of loss of low beam headlamp function. Only one of these incidents was allegedly severe in nature. But the allegations in this case—a pending lawsuit—are contradicted by the associated police report, which states that the driver attributed the crash to the fact that he was drowsy, and does not include the allegation that the subject component failure caused the alleged crash.
- Of the four alleged injuries that GM is aware of, three were minor in nature. GM could not determine the severity of the fourth alleged injury.
- All property damage claims relating to these crashes were limited: (i) seven repairable fire damage claims; (ii) three non-subject vehicles receiving crash damage; and (iii) one damaged stop sign.

Similarly, with respect to the 126 unique fire-related reports:

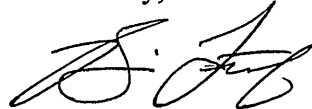
- GM is not aware of any allegations of an unattended vehicle fire relating to the alleged defect.
- All 14 reports involving open flame or fire indicate that the fire was either extinguishable or self-extinguished, and that the resulting vehicle damage was repairable.
- GM has no direct evidence of a fire-related report involving the Delphi-produced HDM that was installed as original equipment in the subject vehicles. GM has obtained sample melted HDMs from the field, and every melted or burned HDM that GM has analyzed is an aftermarket HDM that GM did not install as original equipment in the subject vehicles. GM's position is that the vast majority, and perhaps all, of the 126 unique fire-related reports in the field data involve this aftermarket component. This position is based on the in-depth analysis of melted or burned parts returned from the field which confirmed that the parts were an aftermarket design. The GM HDM relay also has an internal thermal protection system that protects the component from overheating. Many of the aftermarket parts that GM analyzed did not have the thermal protection feature.



**CONCLUSION**

GM is continuing to monitor available field data and will, in consultation with NHTSA, expand the recall if future field data demonstrates that other subject vehicles contain a safety related defect. Please contact me if you require further information about this response or the nature or scope of our searches.

Sincerely,



Brian Latouf, Executive Director  
Global Safety and Field Investigations

cc: Mr. Sean Hays

**Enclosures**

ATT\_1\_GM – Public copy of GM’s document production

ATT\_2\_GM\_CONF – Nonpublic copy of GM’s document production

ATT\_3\_DELPHI\_CONF – Nonpublic copy of Delphi’s document production

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