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June 26, 2015

Mr. Frank S. Borris, Director  
Office of Defects Investigation  
National Highway Traffic Safety Administration  
1200 New Jersey Avenue SE, Room W45-302  
Washington, DC 20590

Dear Mr. Borris:

Subject: DP15-001:NVS-213cni

The Ford Motor Company (Ford) response to the agency's May 15, 2015 letter concerning loss of power steering assist while driving in 2008 through 2011 model year Ford Escape and Mercury Mariner vehicles is attached.

If you have any questions concerning this response, please feel free to contact me.

  
for Wayne Bahr

Enclosures

FORD MOTOR COMPANY (FORD) RESPONSE TO DP15-001

Ford's response to this Defect Petition information request was prepared pursuant to a diligent search for the information requested. While we have employed our best efforts to provide responsive information, the breadth of the agency's request and the requirement that information be provided on an expedited basis make this a difficult task. We nevertheless have made substantial effort to provide thorough and accurate information, and we would be pleased to meet with agency personnel to discuss any aspect of this Defect Petition.

The scope of Ford's investigation conducted to locate responsive information focused on Ford employees most likely to be knowledgeable about the subject matter of this inquiry and on review of Ford files in which responsive information ordinarily would be expected to be found and to which Ford ordinarily would refer. Ford notes that although electronic information was included within the scope of its search, Ford has not attempted to retrieve from computer storage electronic files that were overwritten or deleted. As the agency is aware, such files generally are unavailable to the computer user even if they still exist and are retrievable through expert means. To the extent that the agency's definition of Ford includes suppliers, contractors, and affiliated enterprises for which Ford does not exercise day-to-day operational control, we note that information belonging to such entities ordinarily is not in Ford's possession, custody or control.

Ford has construed this request as pertaining to vehicles manufactured for sale in the United States, its protectorates, and territories.

Ford notes that some of the information being produced pursuant to this inquiry may contain personal information such as customer names, addresses, telephone numbers, and complete Vehicle Identification Numbers (VINs). Ford is producing such personal information in an unredacted form to facilitate the agency's investigation with the understanding that the agency will not make such personal information available to the public under FOIA Exemption 6, 5 U.S.C. 552(b)(6).

Answers to your specific questions are set forth below. As requested, after each numeric designation, we have set forth verbatim the request for information, followed by our response. Unless otherwise stated, Ford has undertaken to provide responsive documents dated up to and including May 15, 2015, the date of your inquiry. Ford has searched within the following offices for responsive documents: Sustainability, Environment and Safety Engineering, Ford Customer Service Division, Marketing and Sales Operations, Quality, Global Core Engineering, Office of the General Counsel, and North American Product Development.

Request 1

State the numbers of vehicles covered by the subject recall by model, model year, recall completion status and recall labor operation, if applicable.

Answer

Ford records indicate that the approximate total number of subject vehicles covered by the subject recall in the United States (the 50 states and the District of Columbia), protectorates, and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 736,407.

The number of subject vehicles by model, model year, recall completion status, and recall labor operation is shown below:

Model: Ford Escape	Model Year				Grand Total
	2008	2009	2010	2011	
<b>Total in program</b>	247,601	147,825	199,604	28,568	<b>623,598</b>
<b>Labor Operation Code For Remedied Vehicles</b>					
14S05C	141,775	96,223	138,913	20,624	397,535
14S05D	2,674	880	518	39	4,111
14S05E	1,253	598	245	26	2,122
<b>Recall Completion Status</b>	59%	66%	70%	72%	65%

Model: Mercury Mariner	Model Year				Grand Total
	2008	2009	2010	2011	
<b>Total in program</b>	52,733	25,607	30,079	4,390	<b>112,809</b>
<b>Labor Operation Code For Remedied Vehicles</b>					
14S05C	30,924	17,078	21,409	3,331	72,742
14S05D	613	154	60	4	831
14S05E	245	85	34	2	366
<b>Recall Completion Status</b>	60%	68%	71%	76%	66%

Note - Labor Operation Codes:

14S05C: Reflash Instrument Cluster (IC) and Power Steering Control Module (PSCM)

14S05D: Replace Torque Sensor

14S05E: Replace PSCM

The purpose of the remedy procedure is to mitigate the occurrence of the loss of power steering assist while driving due to the torque sensor, and to provide audible and visual warnings to the driver if a torque sensor fault is detected by updating the PSCM software. Additionally, if DTC's related to the PSCM (B2277 and B1342) or Torque Sensor (B2278) are present at the time of service, additional parts were replaced to better manage customer expectations. Details of the DTCs are provided in our response to Request 8.

Request 2

Provide the following information for each subject vehicle:

- Vehicle identification number (VIN);
- Model;
- Model Year;
- Subject recall completion date;
- Subject recall labor operation code; and
- EPS DTC, if applicable.



Answer

To the extent available, the requested data for each subject vehicle is provided in Appendix A. In addition, Ford is providing the customer and technician comments that were included in the warranty claim to supplement any Diagnostic Trouble Code (DTC) information provided.

Request 3

State the number of each of the following, received by Ford, or of which Ford is otherwise aware, which relate to, or may relate to, the alleged defect in the subject vehicles:

- a. Consumer complaints, including those from fleet operators;
- b. Field reports;
- c. Reports involving a crash, injury or fatality;
- d. Property damage claims;
- e. Third-party arbitration proceedings where Ford is or was a party to the arbitration; and
- f. Lawsuits, both pending and closed, in which Ford is or was a defendant or codefendant.

For each subpart, separately state the total number of each item (e.g., consumer complaints, field reports, etc.). Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

Answer

For purposes of identifying reports of incidents that may be related to the alleged defect and any related documents, Ford has gathered "owner reports" and "field reports" maintained by Ford Customer Service Division (FCSD), and claim and lawsuit information maintained by Ford's Office of the General Counsel (OGC).

Descriptions of the FCSD owner and field report systems and the criteria used to search each of these are provided in Appendix B.

The following categorizations were used in the review of reports located in each of these searches:

Category	Allegation
A1	Loss of power steering assist while driving, after receiving the recall remedy, due to the Torque Sensor - DTC B2278
A2	Loss of power steering assist while driving, after receiving the recall remedy, due to the PSCM motor - DTC B2277
A3	Loss of power steering assist while driving, after receiving the recall remedy, due to the PSCM - DTC B1342
A4	Loss of power steering assist while driving, after receiving the recall remedy, due to other cause
A5	Loss of power steering assist while driving, after receiving the recall remedy - ambiguous cause
B1	Loss of power steering assist, after receiving the recall remedy - unknown if while driving
B2	Ambiguous loss of power steering assist after receiving the recall remedy

We are providing electronic copies of reports categorized as "B1" and "B2" as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect.

Owner Reports: Records identified in a search of the FMC360 Owner Relations System, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described above. The number and copies of relevant owner reports identified in this search that allege loss of power steering assist while driving after receiving the recall remedy in a subject vehicle are provided in the FMC360 portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive (i.e., not ambiguous) duplicate owner reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately.

Legal Contacts: Ford is providing, in Appendix B, a description of Legal Contacts and the activity that is responsible for this information. To the extent that responsive (i.e., not ambiguous) owner reports indicate that they are Legal Contacts, Ford has gathered the related files from the Office of General Counsel (OGC). Non-privileged documents for files that were located that are related to the responsive owner reports are provided in Appendix D.

Field Reports: Records identified in a search of the Common Quality Indicator System (CQIS) database, as described in Appendix B, were reviewed for relevance and sorted in accordance with the categories described above. The number and copies of relevant field reports identified in this search that allege loss of power steering assist while driving after receiving the recall remedy in a subject vehicle are provided in the CQIS portion of the database contained in Appendix C. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive duplicate field reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one

incident and have more than one report associated with their VINs. These reports have been counted separately. In addition, field reports that are duplicative of owner reports are provided in Appendix C but are not included in the field report count.

VOQ Data: This information request had an attachment that included 106 Vehicle Owner Questionnaire (VOQ) numbers and the petitioner's VOQ. Ford made inquiries of its FMC360 database for customer contacts, and its CQIS database for field reports regarding the vehicle identified in the VOQ. Ford notes that in instances where the VOQ does not contain the VIN or the owner's last name and zip code, it is not possible to query the databases for owner and field reports specifically corresponding to the VOQs.

Crash/Injury Incident Claims: For purposes of identifying allegations of accidents or injuries that may have resulted from the alleged defect, Ford has reviewed responsive warranty claims, owner and field reports, and lawsuits and claims. A chart identifying potentially relevant allegations is being provided in Appendix E. Copies of reports corresponding to these alleged incidents are provided in the FMC360, CQIS, and Analytical Warranty System (AWS) portions of the database provided in Appendix C. To the extent available, copies of complaints, first notices, or FMC360 reports relating to matters shown in this appendix are provided Appendix D.

No injuries were noted with any of the accident allegations. Two of the alleged accidents (OGC case number D100470 and FMC360 report CAS-5500177-V2Y0R0) noted simultaneous loss of steering and braking prior to the alleged accident. This scenario is not consistent with a fault in the Electronic Power Assist Steering (EPAS) system. A vehicle inspection at a dealership after one alleged accident (CQIS report FEECR016 and OGC case number D112150) did not find any issues with the vehicle after a road test, inspection on the lift, and a scan for DTCs. The remaining alleged accident reports did not contain sufficient information to determine the root cause of any EPAS system contribution, if at all, to the accident.

Claims, Lawsuits, and Arbitrations: For purposes of identifying incidents that may relate to the alleged defect in a subject vehicle, Ford has gathered claim and lawsuit information maintained by Ford's OGC. Ford's OGC is responsible for handling product liability lawsuits, claims, and consumer breach of warranty lawsuits and arbitrations against the Company.

Lawsuits and claims gathered in this manner were reviewed for relevance and sorted in accordance with the categories described above. Ford has also located other lawsuits, claims, or consumer breach of warranty lawsuits, each of which is ambiguous as to whether it meets the alleged defect criteria. We have included these lawsuits and claims as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these lawsuits and claims is insufficient to support a determination that they pertain to the alleged defect.

We are providing the requested detailed information, where available, on the responsive and ambiguous lawsuits and claims in Appendix C in the Legal Claim/Lawsuits tab. The number of relevant lawsuits and claims identified is also provided in this appendix. To the extent available, copies of complaints, first notices, or FMC360 reports relating to matters shown in this appendix are provided Appendix D.



Request 4

Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 3, state the following information:

- a. Ford's file number or other identifier used;
- b. The category of the item, as identified in Request No. 3 (i.e., consumer complaint, field report, etc.);
- c. Vehicle owner or fleet name (and fleet contact person), address, and telephone number;
- d. Vehicle's VIN;
- e. Vehicle's make, model and model year;
- f. Vehicle's mileage at time of incident;
- g. Incident date;
- h. Report or claim date;
- i. Whether a crash is alleged;
- j. Whether property damage is alleged;
- k. Number of alleged injuries, if any; and
- l. Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2010, or a compatible format, entitled "DP15\_001\_ INCIDENT DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Answer

Ford is providing owner and field reports in the database contained in Appendix C in response to Request 2. To the extent information sought in Request 3 is available for owner and field reports, it is provided in the database. To the extent information sought in Request 3 is available for lawsuits and claims, it is provided in Appendix C in the Legal Claim/Lawsuits tab.

Request 5

Produce copies of all documents related to each item within the scope of Request No. 3. Organize the documents separately by category (i.e., consumer complaints, field reports, event data recorder reports, police reports, etc.) and describe the method Ford used for organizing the documents. Describe in detail the search methods and search criteria used to identify the items in response to Request No. 3.

Answer

Ford is providing owner and field reports in the database contained in Appendix C in response to Request 2. Copies of complaints, first notices, or FMC360 reports relating to matters shown in Appendix C in the Legal Claim/Lawsuits tab are provided in Appendix D. To the extent information sought in Request 4 is available, it is provided in the referenced appendices.

Detailed descriptions of the search criteria, including all pertinent parameters, used to identify the reports provided in response to Request 3 are described in Appendix B.

Request 6

State the number of the following components Ford has sold that may be used in the subject vehicles by component name, part number (both service and engineering/production), model and model year of the vehicle in which it is used and month/year of sale (*including the cut-off date for sales, if applicable*):

- a. Torque sensor;
- b. Power steering control module (PSCM); and
- c. Steering column assembly.

For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number). Also identify by make, model and model year, any other vehicles of which Ford is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.

Answer

As the agency is aware, Ford service parts are sold in the U.S. to authorized Ford and Lincoln dealers. Ford has no means to determine how many of the parts were actually installed on vehicles, the vehicle model or model year on which a particular part was installed, the reason for any given installation, or the purchaser's intended use of the components sold.

Ford is providing the total number of Ford service replacement torque sensor kits and steering column assemblies by part number (both service and engineering) and year of sale, where available, in Appendix F. Information pertaining to production and service usage for each part number, and supplier point of contact information, is also included in Appendix F. Ford notes the steering column assembly is sometimes referred to as the power steering control module (PSCM).

Request 7

Describe the original design and operation of the electric power steering system used in the subject vehicles, including a diagram of all component locations.

Answer

The original design and operation of Electronic Power Assist Steering (EPAS) system used in the subject vehicles, including a diagram of all component locations is provided in Appendix G.

Request 8

Provide the following information regarding the original (pre-recall) EPS system diagnostics and fault detection logic:

- a. A table listing all diagnostic trouble codes associated with the EPS system;
- b. The basic name/description for the trouble code;
- c. A description of the specific fault detection logic for setting the code;
- d. A description of all visual and audible warnings provided to the driver when the code is set;
- e. A description of the failsafe operating mode when the code is set (e.g., steering reverts to manual mode);



- f. For all failsafe operating modes involving transition to manual steering mode, state the time interval used to make the transition and identify any limits or restrictions on when the transition is made (e.g., any conditions in which transition cannot occur when torque is being applied to the steering wheel);
- g. A description of the conditions necessary for clearing the warning lamps and failsafe operating mode; and
- h. A description of the conditions necessary for clearing the DTC.

#### Answer

Information regarding the original (pre-recall) PSCM system diagnostics and fault detection logic is provided in Appendix H.

#### Request 9

Provide the following warranty claim data and statistical estimates for each of the following in the vehicles covered by the subject recall: 1) torque sensor failures; 2) EPS motor failures; 3) EPS PSCM failures; and 4) other EPS system fault conditions:

- a. Total warranty claim counts to date, including claims before the recall, recall repairs, and claims after the recall (provide this information by model and model year);
- b. Estimated failure rates at 6 years in service; and
- c. Estimated failure rates at 10 years in service.

#### Answer

The total numbers of PSCM and torque sensor warranty claim counts for vehicles covered under the subject recall, including claims before the recall, recall repairs, and claims after the recall by model and model year are provided in Appendix I as requested. Warranty claim counts include claims made under the new vehicle warranty, the Premium Care extended warranty plan, and replacements made under recall 14S05. Customer paid repairs would not be included in the warranty claim counts.

The level of detail needed to perform accurate PSCM component projections is not present in the warranty claim counts. During the new vehicle warranty period of the subject vehicles, the repair for any PSCM related concern was replacement of the entire PSCM and warranty data will only reflect the number of PSCM replacements, not the distribution of the underlying root cause components such as the torque sensor or the power steering motor. Ford reviewed the warranty claims provided in Appendix C and found that while some contain DTCs and root cause notations provided by the technician, many do not. In addition, recall 14S05 was launched 45 months after the last subject vehicle was produced (nine months after the 3 year/36 month new vehicle warranty period), and data regarding the root causes and number of consumers that chose to have their vehicles repaired at a third party facility is not available.

As a surrogate for the component projections, Ford is providing 6 years in service and 10 years in service estimated replacement projections for the PSCM and torque sensor as a system, including warranty and recall replacement data for the PSCM and torque sensor combined as this system. Ford is submitting the projections in Appendix J with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.

Request 10

Describe, provide copies of all documents related to, and summarize the results of, all testing performed by Ford either before production or since Job #1 related to the following in the vehicles covered by the subject recall:

- a. Measuring steering efforts in assisted and manual steering modes in low speed steering maneuvers (less than 10 mph);
- b. Measuring steering efforts in assisted and manual steering modes in cornering maneuvers (e.g., left and right turns at intersections);
- c. Measuring steering efforts in assisted and manual steering modes in curves representative of highway exit ramps;
- d. Measure steering efforts in assisted and manual steering modes in high-speed avoidance maneuvers; and
- e. Human factors testing to assess driver reaction to loss of power steering assistance in any of the maneuvers listed above, or any other driving maneuvers.

Answer

Ford did not perform any testing as described in Request 10. However, information was previously provided to Transport Canada regarding the subject vehicle and its performance to the European Economic Community (EEC) 92/62 maximum steering wheel rim pull test requirement. The engineering estimated value for this test is 147 Newtons of rim pull without steering assist for the subject vehicles, which is well below the EEC requirement of 300 Newtons.

Request 11

Provide the following information regarding the subject recall:

- a. Describe the root cause of the EPS defect condition addressed by the recall;
- b. Provide copies of all presentations, reports and briefing material related to the recall review process and final decision meeting;
- c. Explain why the remedy procedure provides for replacement of EPS torque sensor or steering column for fault codes associated with the torque sensor, EPS motor or EPS PSCM at the time the recall remedy is performed, but not after the recall has been performed;
- d. Describe in detail how the EPS system recalibration software used as the recall remedy functions to prevent or reduce the occurrence of loss of power steering assistance while driving;
- e. Describe all visual and audible warnings provided to the driver when EPS system faults occur after the recalibration has been performed;
- f. Describe all conditions which could result in a loss of power steering assist while driving after receiving the recall remedy; and
- g. State the numbers of incidents of loss of power steering assist while driving that have occurred in the subject vehicles after the remedy procedure for 14V-284 was performed due to: 1) EPS torque sensor failures; 2) EPS motor failures; 3) EPS PSCM failures; and 4) other EPS system fault conditions.

Answer

- a. The steering torque sensor uses a brush that sweeps across a conductive surface to provide a signal to the PSCM. Analysis of components from complaint vehicles found the root cause of the PSCM defect condition addressed by the recall remedy to be degradation



of the conductive surface of the torque sensor, resulting in elevated noise in the signal provided to the PSCM. The greatest amount of surface degradation was found to be at the neutral position of the sensor, where the brush was most frequently in contact with the surface. This position would correlate to a customer driving straight on a level roadway, when the PSCM would not be required to provide steering assist. The PSCM responds to the elevated signal noise by recording a fault code (DTC B2278) and removing power steering assist. Early in the 2011 model year, a lubricant was added to the conductive surface of the torque sensor to reduce the degradation of the conductive surface over the long term.

- b. Ford is submitting copies of the material related to the recall review and decision making process for field service action 14S05 / 14V-284 in Appendix K with a request for confidentiality under separate cover to the Agency's Office of the Chief Counsel pursuant to 49 CFR Part 512.
- c. The purpose of the remedy procedure is to mitigate the occurrence of the loss of power steering assist while driving due to the torque sensor, and to provide audible and visual warnings to the driver if a torque sensor fault is detected by updating the PSCM software. Additionally, if DTC's related to the PSCM (B2277 and B1342) or Torque Sensor (B2278) are present at the time of service, additional parts were replaced to better manage customer expectations.
- d. The functional details of the PSCM system recalibration were reviewed with the Agency during an April 8, 2014 meeting at the Agency's Vehicle Research and Technology Center (VRTC), followed by vehicle demonstration drive. A copy of the presentation was provided to the Agency's Office of Chief Counsel with a request for confidentiality on April 22, 2014.
- e. When the PSCM records a fault, it will provide a visual warning to the driver consisting of a message stating "Power Steering Assist Fault" or illumination of the wrench light, depending on the capability of the vehicle's instrument cluster. All vehicles will also alert the driver with an audible tone when the visual warning is displayed.
- f. The reduction or removal of power steering assist is part of Ford's FMEM strategy when necessary to avoid other potentially more significant error state such as vehicle stalling (in low voltage conditions), permanent damage to the PSCM (in high temperature conditions), or auto-steer (in erroneous signal conditions). As previously discussed, the recall remedy addressed the torque sensor fault (DTC B2278). There are other DTCs listed in Ford's response to Request 8 that could result in the loss of power steering assist while driving. Conditions associated with these DTCs include factors outside the PSCM, such as vehicle network communication issues and temporary "reduced assist" conditions related to turning the steering rack to its end travel or over-temperature of the PSCM due to periods of heavy sustained use by the driver. In addition, the PSCM may respond by reducing assist during periods of low battery voltage or high steering system friction. In these cases, the PSCM will not record a DTC, as there is no fault with the system.

Details for these conditions are discussed below.

#### Low Voltage

Some of the reports pertain to reduced assist resulting from low battery voltage, such as when the vehicle is exposed to cold ambient conditions, and operated at near idle engine speed, and with heavy electrical load. When the electric power assist system detects low system voltage, it will reduce the amount of assist it provides. Reduced assist is a



protective response from the EPAS system to prevent engine stalling due to the low system voltage. It is not a defect of the EPAS system but instead a symptom of a potentially failing battery or other electrical system concern. Service bulletin SSM 20895 (provided in Appendix L) and the workshop manual direct the technician to inspect the vehicle electrical system for the root cause of the low system voltage. This condition of **reduced** assist could mistakenly be reported as a **loss** of assist. While low battery voltage may not always be a contributing factor to a report of reduced/loss of steering assist, 74% of all the reports provided in this response occurred in colder months (November through March).

#### Steering Stop

Some of the reports provided in this response indicated a perceived loss of assist during the process of backing out of a parking space with the steering wheel fully turned to one side or the other. The design of the steering system in these vehicles includes software that will reduce the amount of steering assist near the physical rack stops to soften the impact of the steering rack at the end of travel. In early versions of the software, when reversing the vehicle, it was possible for the driver to force the steering wheel past the software assist reduction. In this condition, when the steering wheel is fully turned against a stop and the driver begins to turn the steering wheel in the opposite direction, there would initially be a higher force required to start to turn the wheel. After the initial higher effort to begin to turn the wheel, the power assist system would return to regular effort levels. The power assist software was later updated to eliminate this initial high effort feel. The low vehicle speeds associated with this condition would not be expected to present any vehicle control concerns. The perceived loss of assist is not a defect of the EPAS system and no EPAS-specific driver notification would be required. Vehicle owners that received the PSCM reflash as part of the recall remedy may perceive a change in the feel of the steering system at its end of travel (e.g.: higher efforts or reduced turning radius) depending on the vintage of the PSCM software in their vehicle prior to the reflash, but the physical travel of the steering gear is unchanged.

#### PSCM Over Temperature

Under extreme usage conditions the EPAS system may begin to overheat and consequently revert to a limited assist mode. The Owner's Guide provides the following instructions:

Your vehicle is equipped with an Electric Power-Assisted Steering (EPAS) system. There is no fluid reservoir to check or fill. If your vehicle loses electrical power while you are driving (or if the ignition is turned off), you can steer the vehicle manually, but it takes more effort. Under extreme usage conditions, the steering effort may increase. This occurs to prevent overheating and permanent damage to your steering system. If this should occur, you will neither lose the ability to steer the vehicle manually nor will it cause permanent damage. Typical steering and driving maneuvers will allow the system to cool and steering assist will return to normal.

Ford is providing the portion of the Owner's Guide that contains the above information in Appendix M. Again, this is a protective response and not an indication of a malfunction of the EPAS system.

#### Steering Wheel Dithering

Steering wheel dithering prior to a loss of assist has been noted in a number of reports, providing tactile feedback that the system is not functioning normally. As previously noted,

the degradation of the conductive surface of the torque sensor may result in increased levels of signal noise to the PSCM. This increased signal noise may result in the steering wheel dither experienced by the driver. The amount of input supplied by the EPAS system to the steering column during this dithering is limited to approximately 2 Nm maximum and, while readily noticeable, can be easily managed by the driver. The updated PSCM software provided with the recall remedy is more tolerant of the signal noise. However, if the signal noise increases beyond this level, a diagnostic trouble code (DTC B2278) for the torque sensor will be stored in the system and a visual and audible warning will be given to the driver. Should the signal noise persist and/or increase, the PSCM may eventually remove power steering assist, but only at the beginning of the next key cycle (with the accompanying visual and audible warnings). The repair for this condition, as defined in the workshop manual, is torque sensor replacement.

- g. Consumer complaints, field reports, and lawsuits alleging a loss of assist while driving after the recall remedy was performed are provided in Appendix C and would be categorized A1. The lack of detailed information in the reports prevents the determination of the root cause of the loss of assist. The warranty claims alleging a loss of assist while driving after the recall remedy was performed are provided in Appendix C and would be categorized A1. Some warranty claims contain DTCs and root cause notations provided by the technician, but many do not. Therefore, Ford is unable to provide an accurate subsystem breakdown for the loss of power steering assist while driving after the recall remedy procedure as requested. However, given the large proportion of torque sensor replacements and the comments noted in the reports provided, Ford believes the degrading conductive surface of the torque sensor is still the primary cause of the loss of power steering assist, and the updated PSCM software provided by the remedy delays the removal of assist for this condition until the beginning of the next key cycle, when the vehicle is not moving.

#### Request 12

Provide Ford's assessment of the following:

- a. Each of the post-remedy failure allegations contained in the attachment ODI complaints, including the petitioner's; and
- b. The effectiveness of the remedy procedure for the subject recall.

#### Answer

Ford's assessment of each of the ODI complaints provided with this IR is provided in Appendix N. Ford notes there were no accident or injury allegations in any of the provided VOQs.

The remedy procedure for the subject recall has proven effective as the number of reports of loss of assist while driving after the remedy procedure are very low. The specific proportion of torque sensor related reports are difficult to estimate due to the lack of details provided with the reports. However, given the large proportion of torque sensor replacements and the comments noted in the reports, Ford believes the degrading conductive surface of the torque sensor is still the primary cause of the loss of power steering assist, and now that the updated EPAS software delays the removal of assist until the beginning of the next key cycle for this condition, the occurrence of the loss of power steering assist while driving for this condition is also removed.

Even in the unlikely event of loss of power steering assist, base steering functionality is maintained, including the mechanical linkage between the steering wheel and the road



surface. In addition, the vehicle's braking functionality remains unaffected, providing effective means for the driver to control the vehicle. After reviewing and assessing the reports provided in this response, the majority of the incidents appear to have occurred at lower vehicle speeds and drivers were able to safely control their vehicle.

The complaint rate of 0.4/1000 is very low, and includes complaints that pertain to very slow vehicle speeds in which the risk of loss of vehicle control is also extremely low. Furthermore, the majority (86%) of the reports provided in this response do not note the loss of power steering assist occurred while driving.

We believe this recall remedy was adequate to address the safety concern presented by this condition.

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