

BMW Group

April 1, 2022

Bruce York
Chief, Vehicle Defects Division – B
Office of Defects Investigation
National Highway Traffic Safety Administration
1200 New Jersey Ave., S.E.
Washington, DC 2059

Re: PE21-021 – Peer Review

Dear Mr. York:

BMW of North America, LLC (a subsidiary of BMW AG, Munich, Germany (“BMW”)) is submitting its response to NHTSA’s Information Request, dated February 4, 2022, in the above captioned matter. BMW understands that it is not the focus of the Information Request but, as identified by NHTSA as a peer, has been requested to provide information on this matter so that the agency can perform a comparative analysis.

As agreed with the agency, BMW is responding today with the remaining portion of our response. Today’s response supplements the information we submitted to the agency on March 18, 2022. We appreciate NHTSA’s approval of our request for an extension. For completeness, we are also including the portion of our response that was submitted to NHTSA by the original due date of March 18, 2022.

Our response today includes material requested to be afforded confidentiality and, therefore, that portion is being submitted to the Office of Chief Counsel. The non-confidential portion of our response is being submitted to your office and is attached to this letter.

Should you have any questions pertaining to the information enclosed with this letter, please contact me at (201) 571-5360, or Martin Rapaport of my staff at (201) 571-5208.

Company
BMW of North America, LLC

BMW Group Company

Mailing address
PO Box 1227
Westwood, NJ
07675-1227

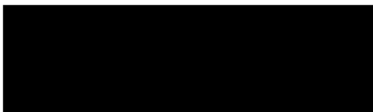
Office address
300 Chestnut Ridge Road
Woodcliff Lake, NJ
07677-7731

Telephone
(201) 307-4000

Fax
(201) 571-5479

Website
bmwusa.com

Sincerely,



Sam Campbell
Department Head
Safety Engineering & Intelligent Transportation Systems

Attachment:

BMW-Response-Folder-[RESPONSE-R1], -[RESPONSE-R2], -[RESPONSE-R5]

Cc:

A. Carlson, Esq., NHTSA – (OCC)

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INTRODUCTION

In accordance with NHTSA's instructions, BMW has repeated each of the agency's requests verbatim, and provided our written responses directly following each request. As necessary, the written information includes references to additional documentation (attachments) that are included within, and form a part of, our complete response. The information being provided has been searched within, and collected from, various systems and databases as noted below and outlined in our detailed written responses. The information is current as of the date of NHTSA's Information Request, February 4, 2022.

Information responsive to this request has been searched within, and collected from, departments involving Vehicle Production, Technical Development and Engineering, Technical Campaigns, Parts Logistics, and Aftersales Technical Service. Some of the information being provided is claimed to be confidential pursuant to 5 U.S.C. 552(b)(4) and 49 CFR 512, and is being submitted to NHTSA's Office of Chief Counsel. The non-confidential portion of the information is being submitted to the agency's Office of Defects Investigation.

BMW notes that some of the information included with this response may contain personal (personally identifiable information ("PII")) such as BMW employee names and contact information, as well as, customer names, addresses, telephone numbers, and also complete Vehicle Identification Numbers (VIN). It is our understanding that NHTSA will redact such information in accordance with FOIA Exemption 6 (5 U.S.C. 552(b)(6)) should the agency publicly release documents containing such information.

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REQUEST 1

1. **State, by model and model year, the number of subject and peer vehicles BMW has manufactured for sale or lease in the United States. Separately, for each subject and peer vehicle manufactured to date by BMW, state the following:**
 - a. **Vehicle identification number (VIN);**
 - b. **Make**
 - c. **Model;**
 - d. **Model Year;**
 - e. **Subject component part number and design version installed;**
 - f. **Date of manufacture of vehicle;**
 - g. **Date of manufacture of subject component;**
 - h. **Date warranty coverage commenced; and**
 - i. **The State in the United States where the vehicle was originally sold or leased (ordelivered for sale or lease);**

Provide the table in Microsoft Access 2010, or a compatible format, entitled “PRODUCTION DATA.” A pre-formatted data collection file, which provides further details regarding this submission, will be provided to you.

RESPONSE 1

Information collected to prepare Response 1 was sourced from a vehicle production database and a technical campaign system and is current as of February 4, 2022.

The number of subject vehicles BMW has manufactured for sale or lease in the United States is contained in Table 1. Table 1 pertains to subject vehicles equipped with the “N47” (2.8 liter Diesel (28d)) engine and subject vehicles equipped with the “N57” (3.5 liter Diesel (35d)) engine. *BMW notes that the definition of subject vehicles pertains to vehicles within 21V-586 and, therefore, include vehicles originally manufactured with the subject component, and vehicles which received a subject component as a replacement part during a service visit.* Accordingly, subject vehicles manufactured with the subject component consist of Model Years 2017-2018, while subject vehicles receiving a subject component as a replacement part during a service visit consist of Model Years 2014-2016.

Model	MY2014	MY2015	MY2016	MY2017	MY2018
328d	424	96	64	344	728
328d xDrive	230	115	99	766	1,240
535d	269	40	75	0	0
535d xDrive	110	8	7	0	0
760Ld xDrive	0	13	0	0	0
X3 xDrive28d	0	95	102	2	0
X3 xDrive35d	265	256	66	2,275	3,527

Table 1.

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The number of peer vehicles BMW has manufactured for sale or lease in the United States is contained in Table 2. Table 2 pertains to peer vehicles equipped with the “N47” (2.8 liter Diesel (28d)) engine, peer vehicles equipped with the “N57” (3.5 liter Diesel (35d)) engine, and a limited number of peer vehicles equipped with the “B57” (4.0 liter Diesel (40d)) engine.

Model	MY2014	MY2015	MY2016	MY2017	MY2018
328d	4,265	1,020	425	150	0
328d xDrive	5,629	2,351	1,174	392	0
535d	2,324	575	650	0	0
535d xDrive	2,294	513	457	0	0
540d xDrive	0	0	0	0	290
760Ld xDrive	0	302	0	0	0
X3 xDrive28d	0	2,151	1,549	20	0
X3 xDrive35d	3,518	6,902	1,587	355	2

Table 2.

Response Folder “RESPONSE-R1-PRODUCTION-DATA” contains Attachment “PRODUCTION-DATA”, which provides the requested information for the subject vehicles, and peer vehicles, respectively, that BMW has manufactured for sale or lease, including information responding to the subparts of Request 1. The Attachment consists of three tabs, one tab pertaining to the subject vehicles, and the other two tabs pertaining to the peer vehicles. One tab for peer vehicles consists of vehicles equipped with the “N47” engine or the “N57” engine, while the other tab for peer vehicles consists of vehicles equipped with the “B57” engine. Within each tab, the information is organized by Model Year (oldest to newest), Model, and date of vehicle manufacture from oldest to newest.

REQUEST 2

2. **Produce copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject and peer vehicles, that BMW has issued to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities. This includes, but is not limited to, bulletins, advisories, informational documents, training documents, or other documents or communications, with the exception of standard shop manuals. Also, include the latest draft copy of any communication that BMW is planning to issue within the next 120 days.**

RESPONSE 2

Information collected to prepare Response 2 was sourced from the aftersales technical service department and is current as of February 4, 2022.

Response Folder “RESPONSE-R2-SERVICE-INFORMATION” provides the requested information that relate to, or may relate to, the alleged defect in the subject and peer vehicles that has been released to BMW dealers. The folder contains two subfolders, denoted as “B130121-Recall-21V-586” and “B011417-Extended-Warranty”, that pertain to the recall action, and to the extended warranty program, respectively. Within each subfolder are the service and warranty information documents that have been released to BMW dealers. Within each subfolder, the document filenames contain the date of release.

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REQUEST 3

3. 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 and peer vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, BMW, or in conjunction with the component supplier or other party. *Include all actions related (sic) NHTSA recall 21V-586.* 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.

RESPONSE 3

Information collected to prepare Response 3 was sourced from technical development and engineering departments and is current as of February 4, 2022.

Response Folder “CONF-RESPONSE-R3” contains subfolders “RP6_Development”, “RP7_Development”, “PLT_Initial-Phase”, “PLT_Root-Cause-Detection”, and “PLT_Final-Phase” which provide responsive information (documents) pertaining to the various analyses, evaluations, and testing (“actions”) which are pertinent to the respective subfolder.

Response Folder “CONF-RESPONSE-R3” also contains Attachment “CONF-Response-R3” which “maps” all of these documents (analyses, evaluations, and testing (“actions”)) to their respective subfolders within the main Response Folder “CONF-RESPONSE-R3”. Attachment “CONF-Response-R3” also provides the information responding to Requests 3(a) through 3(f).

REQUEST 4

4. Describe all modifications or changes made by, or on behalf of, BMW or in conjunction with the component supplier or other party, in the design, material composition, manufacture, quality control, supply, functionality, or installation of the subject component *or other components*, from the start of production to date, which relate to, or may relate to, the alleged defect. For each such modification or change, provide the following information:
- a. The date or approximate date on which the modification or change was incorporated into vehicle production;
 - b. A detailed description of the modification or change;
 - c. The reason(s) for the modification or change;

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- d. The part number(s) (service and engineering) of the original component;
- e. The part number(s) (service and engineering) of the modified component;
- f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
- g. When the modified component was made available as a service component; and
- h. Whether the modified component can be interchanged with earlier production components.

Also, provide the above information for any modification or change that BMW is aware of which may be incorporated into vehicle production within the next 120 days.

RESPONSE 4

Information collected to prepare Response 4 was sourced from technical development and engineering departments and is current as of February 4, 2022.

Response Folder "CONF-RESPONSE-R4" contains Attachment "CONF-Response-R4" which provides the information responding to Requests 4(a) through 4(h).

REQUEST 5

5. State the number of each of the following that BMW has sold that may be used in the subject and peer 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. Subject component;
 - b. Any kits that have been released, or developed, by BMW for use in service repairs to the subject component/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 BMW is aware that contain a substantially similar component, whether installed in production or in service, and state the applicable dates of production or service usage.

RESPONSE 5

Information collected to prepare Response 5 was sourced from a parts logistics database and is current as of February 4, 2022.

It is our opinion that parts sales data has limited analytical value regarding its use in assessing the performance of the subject component because this data does not contain information pertaining to the reason for the sale of a particular part. Therefore, it is not possible from parts sales information to determine the number of these parts that have been installed in the subject vehicles for the purpose of repairing a vehicle in which the alleged issue is occurring.

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Response Folder “RESPONSE-R5-PARTS-SALES” contains Attachment “PARTS-SALES” which provides the requested information. Parts sales are provided by calendar year (month is not available), and are irrespective of vehicle model year. Parts sales by vehicle model year are not available in the parts logistics database. Therefore, parts sales by vehicle model year, for the specific model years pertaining to the subject vehicles and peer vehicles, are not available. The figures represent the number of parts shipped from BMW AG to BMW NA. Supplier contact information is contained within Attachment “PARTS-SALES”.

Parts replacement can occur for a variety of reasons and, therefore, the number of parts sold is not reflective of the number of parts that may have been replaced that relate, or may relate, to the alleged defect. Additionally, and for various reasons, such as dealers ordering parts in anticipation of a future need, but later determining that the need did not materialize, dealers will return unused parts and, therefore, the actual volume of parts replaced in vehicles will be less than the volume depicted in the table.

REQUEST 6

6. **Furnish BMW’s assessment of the alleged defect, 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; and**
 - 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;**
 - f. **Rationale for not recalling peer vehicles; and**
 - g. **The reports included with this inquiry.**

RESPONSE 6

Information collected to prepare Response 6 was sourced from technical development and engineering departments and is current as of February 21, 2022.

Introduction

Before providing detailed responses to the subparts of Request 6, we believe it is useful to provide the following additional information. First, a brief summary of this topic is described in the Summary section below and highlight pertinent details that are contained in Attachment “CONF-2022_Overview_CP4.pdf” in Response Folder “CONF-RESPONSE-R6”. Second, a number of additional sections and the referenced attachments therein, provide specific information pertaining to high pressure fuel pump technology, the development of the “RP6” and “RP7” pump for use in the US market, some field observations, and certain analyses that have been performed as part of further pump development and certain related field actions. We believe that this additional information, when reviewed prior to our specific responses to the subparts of Request 6, should be useful to NHTSA during its overall review of this topic.

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Summary

As noted, Attachment "CONF-2022_Overview_CP4.pdf" in Response Folder "CONF-RESPONSE-R6" contains a brief summary and pertinent details pertaining to this topic. Subsequent to development and release of the "RP6", it was noted that, due to certain factors such as out-of-specification levels (and aging) of biodiesel fuel in the US market, this type of fuel could lead to pump performance issues. To address these issues, further pump development was initiated, and an extended warranty program was implemented for "RP6". Additionally, "RP7" development was initiated, and it was eventually released. Over time, it was noticed that similar fuel issues within the US market also affected "RP7", and to a greater degree when compared to "RP6", due to certain "RP7" design parameters. As a result, additional development efforts were undertaken which led to the implementation of a safety recall for "RP7".

Although BMW provides specific information to its owners regarding proper (i.e., within specification) fuel usage, as indicated directly on the vehicle's fuel filler cap, and also described in the owner's manual, the extensive testing and analyses that have been performed during review of the "RP6" and "RP7" field monitoring programs, have demonstrated that proper fuel usage did not occur in many cases, even though it is necessary in order to avoid pump performance issues.

As noted, both "RP6" and "RP7" are affected by these fuel issues. However, Attachment "CONF-2022_Overview_CP4.pdf", indicates that the issue is much more prevalent in the "RP7" than in the "RP6" due to certain design parameters. Generally, the "negative performance ratio" of the "RP7" to the "RP6" is a factor of approximately 3.5. Accordingly, BMW implemented an extended warranty program for "RP6" because we believe the field performance of the "RP6" does not pose an unreasonable risk to motor vehicle safety. However, due to the field performance of the "RP7", a safety recall was implemented in July 2021.

High pressure pump technology

The diesel engines in the N47/N57 and B47/B57 series use a fuel-lubricated diesel high pressure pump (HPP) of type CP4 from Bosch (N47/B47: single-plunger HPP CP4.1 or N57/B57: dual-plunger HPP CP4.2). In the HPP, the fuel is compressed into the connected rail under high pressure by a pump piston. The piston is driven by a pump drivetrain consisting of the camshaft, roller and roller shoe as a connection to the piston. On the one hand, the roller must roll on the cam without slipping and, on the other hand, it must form a hydrodynamic lubrication film with the roller shoe (see attachment „CONF_BMW_package_KATRI_08_19_detail_CP4.pdf“ in folder „CONF-RESPONSE-Q3\04_PLT_Root-Cause-Detection“).

Basic development of CP4 for US use (HPP "RP6")

Due to the fuel lubrication principle, the CP4 HPP requires robust lubrication by means of commercially available fuels. During the basic development of the CP4 by Bosch, the pump was validated for broad market usage based on various standard fuels and particularly borderline fuel mixtures in extensive endurance test and time-lapse test programs (see „Conf_CP4_BMW_Team2_2014_11_05.pdf“ in Folder „CONF-RESPONSE-Q3\01_RP7_development“). For the introduction of BMW Diesel vehicles into the US market starting in model year 2014, the durability was further increased with a robustness package against expected out-of-spec fuels ("WWU" - WorldWide Usage, or within Bosch "RP6" - Robustness Package 6). To avoid failures by aging products from high Biodiesel-content, the BMW application has been released for a maximum of 7% Biodiesel content for worldwide usage. This limit has been included into the owner's manual and the filler cap so that owners are informed at each fueling, that they must not refuel their vehicles with Biodiesel > 7%.

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Series further development of CP4 for US use (HPP "RP7")

To further improve the quality situation and customer satisfaction against out-of-spec fuels of future engine families (B47/B57), in mid-2015 the decision was made to develop another robustness package. The package "WWU+" ("RP7" within Bosch) was implemented by system supplier Bosch and broadly validated in borderline engine tests in accordance with the internal specifications. The engine and vehicle validations have been carried out at BMW in the course of the ongoing B47/B57 developments. Due to the increased robustness shown in simulations and engine tests, application neutrality and positive validation in all development programs, in a running change made in 01/2017 this package was incorporated into production of the "B" and "N" engines.

Field observations / treatments / HPP "RP6"

In the United States, among other markets, the HPP is regarded as an emission-relevant part and thus is subject not only to an extended warranty, but also to a special monitoring and reporting obligation. Within the scope of the field observation, in early 2017 it became apparent that the replacement rate for the HPP "RP6" in N47/N57 vehicles of model year 2014 production had exceeded the permitted reporting limit (further model years followed). Analyses of failed parts revealed in almost all cases deposits of aging products from high Biodiesel-content outside BMW specification as dominant factor.

In consultation with the CARB, since 2017 it has been successively decided to have warranty extensions (10 years / 120,000 miles) for US vehicles with N47/N57 motorization of model years 2014-2018. The basis for this approach was the evaluation that, non-starts or power reduction that could occur during driving generally occur in the perception of customers as a result of the rail pressure being too low during the engine start (starter speed).

2018 field observation

Further standard field observations showed at the end of 2018 an increase in HPP repair cases from the production period of the N47/N57 "RP7" CP4 in so-called "fuel-critical countries" with a focus on certain markets including the US market (see attachment „CONF_PLT-Initial-Status-EN_02_19.pdf“ and „CONF_SGS-Analysis-US_2019.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Initial-Phase“). As a result, in 01/19, a further detailed analysis program was established to determine possible causes (and potential remedies) for the increase in "RP7" repair cases.

Failure analysis and field measures for "RP7"

In the period from 01/19 to 12/21, BMW carried out intensive and extensive tests to determine the causes (and potential remedies) for the increase in failures of Bosch CP4 diesel HPPs with technology status RP7 in individual markets in conjunction with out-of-spec fuels from the production periods after 01/2017. The very broadly based cause analysis enabled identification of the unfavorable interaction of the "RP7" package intended as a robustness measure with the engine kinematics (cam shape) of the CP4 variant for the N47/N57 engines with the presence of fuels substantially deviating from the standard (i.e., out-of-spec fuel) (see attachment „CONF_SGS-Analysis-US_2019.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Initial-Phase“, and attachment „CONF_BMW_package_KATRI_06_21.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Final-Phase“). Importantly, deposits of aging products from high Biodiesel-content were proved to be a dominant factor. Other CP4 combinations in the US market ("RP6" with N47/N57, "RP7" with B57) proved to be substantially more robust. These findings ultimately led, in 2021, to the development of a specific replacement solution, based on the "RP6" variant, for the less robust N47/N57 engines with "RP7" CP4 (production 01/17 – EOP xx/18) (see attachment

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„CONF_methodic-team-recommenadation-scenario-A_pr_0222_TAR.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Final-Phase“). With this HPP "RP6+" (which includes improved roller material), the significantly increased failure rate of the HPP "RP7" in N47/N57 engines (SOP 01/17 to EOP xx/18) in conjunction with fuels which were out-of-BMW-specification, can be reduced to the level of the corresponding engines with "RP6".

Response 6(a) The causal or contributory factor(s)

Components from out-of-spec fuel as well as low-boiling components (gasoline, solvent, kerosene), deterioration products of biodiesel, deposit products resulting from high water content can lead to poor lubrication conditions and thus to sluggishness in the area of the roller / roller shoe. Particularly when the pump is run up to speed from an engine standstill, this can result in increased slip between the roller and cam of the CP4 drivetrain as well as wear in this area (see attachment „CONF_BOSCH_package_KATRI_06_21.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Final-Phase“). Fine metal particles are created once a certain level of wear is reached, which can then lead to leakage of the injectors within the engine and thus to insufficient buildup of high pressure. The "RP7" package in conjunction with the "sharp" cam shape of the N47/N57 engines (SOP 01/17 to EOP xx/18) proved to be less robust in this regard. The most significant effect upon a decrease in pump performance occurs only in so-called "fuel critical countries" which include the US market. (see attachments „CONF_PLT-Initial-Status-EN_02_19.pdf“ „CONF-RESPONSE-Q3\ 03_PLT_Initial-Phase" and „CONF_BMW_package_KATRI_08_19.pdf“ in folder „CONF-RESPONSE-Q3\04_PLT_Root-Cause-Detection“). In the US market, the availability of a specific fuel standard (B20), with biodiesel content up to 20%, which is clearly beyond the BMW release limit of 7%, has been proven as dominant market factor that negatively affects pump performance.

Response 6(b) The failure mechanism(s)

The BMW root cause analysis indicated an unfavorable interaction of the "RP7" package, with the specific cam shapes of the N47/N57 HDP, and in the presence of out-of-spec fuel. The "RP7" package with the main element of a larger roller (12 mm instead of 10 mm) for improvement of the hydrodynamic lubrication conditions between the roller and roller shoe can lead to sluggishness in the presence of out-of-spec fuel components due to the larger lubrication gap surface. In combination with the "sharp" N47/N57 cam shape and the greater inertia of the 12 mm roller, especially when the pump is run up to speed from an engine standstill, this can lead to increased slip between the cam and roller (see attachment „CONF_BOSCH_package_KATRI_06_21.pdf“ in folder „CONF-RESPONSE-Q3\03_PLT_Final-Phase“). When there is preliminary damage in the form of initial "flat spots", the mentioned parts can experience material fatigue and abrasive surface wear. . The other configurations found in the US market (N47/N57 with "RP6" and B57 with "RP7") do not have the unfavorable combination and, therefore, are substantially more robust with respect to this effect.

Response 6(c) The failure mode(s)

The metal chips that form due to insufficient lubrication in the HPP are distributed throughout the entire fuel system (injectors, lines, fuel tank, etc.). The chips usually lead to reduced rail pressure which can result in a non-starting engine or a power reduction. Substantially reduced rail pressure can result in triggering of the rail pressure monitoring (leakage control of diesel high-pressure system) and activation of the desired safety fall-back level (i.e., active engine shut-off device).

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Response 6(d) The risk to motor vehicle safety that it poses

Due to increased field irregularities, in 01/19 as mentioned, a further intensive analysis was initiated. The effort was initially focused on evaluation of the significantly increased HPP failure rate visible in the field for vehicles starting from production 01/17. In addition to the extensive root cause analysis, an evaluation of the possible real effect on customers in case of an error and a risk assessment was performed. The risk assessment was regularly checked based on updated field data, specifically in 3/19, 5/19, 2/20, 3/21, and 7/21.

The risk level as well as the probability that a long-term loss of tractive force while the vehicle is in motion was determined based on a structured risk assessment. The risk assessment, which was carried out in accordance with the specifications for the RAPEX method (RAPEX = Rapid Exchange of Information System), is the rapid alert system of the European Union for hazardous consumer goods; see the Official Journal of the European Union (2010/15/EU) Part IV, 5. Risk assessment guidelines for consumer products, pp. 33-50 and Table 4). The evaluation differentiated between focal markets, engine variants and time periods, among other things.

To date, no critical effects are known from the field. Based on the risk assessment, BMW does not believe the RP6 poses an unreasonable risk to motor vehicle safety.

Document: Official Journal of the European Union (2010/15/EU) Part IV, 5. Risk assessment guidelines for consumer products.

Response 6(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

The diesel high-pressure system is monitored by multilevel error paths. In the case of repeated appearance of the above error mechanism—always in conjunction with out-of-spec fuel—it is possible for metal particles from abrasive wear to decrease the internal leak-tightness of the injectors, which can result in a drop in the required injection pressure. This is detected by the sensor system and incrementally leads to the display of the engine warning light with a torque reduction of the engine. The driver becomes aware of the HPP damage through three possible warning signals:

- Irregular engine operation (low load and idling)
- Torque reduction in 2 levels
- "Drivetrain Malfunction" engine warning light

As wear progresses (further chip contamination), the drop in rail pressure can increase to a level in which the rail pressure monitoring kicks in and there is a safety shutoff of the engine. This can happen while the vehicle is in motion or prevent a desired restart after the engine has been stopped.

Response 6(f) Rationale for not recalling peer vehicles

Based on the risk assessment, BMW believed that the field performance of the RP6 needed to be addressed, and that commensurate with the observed failure rate in the field, an extended warranty program was appropriate.

Importantly, the probability of HPP damage occurring (unacceptable friction due to insufficient

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lubrication) is dominated by the quality of the diesel fuel used. Detailed analyses of failed parts in the US market always revealed a very high case number (approx. 90%) with usage of fuel containing high levels of biodiesel content, far beyond the BMW specification.

The extensive analyses have shown that, in the case of N47/N57 engines with RP7 HPP, the hydrodynamic lubrication between the roller/roller shoe contact surfaces has a significantly more sensitive response to out-of-spec fuel. The primary cause for the significant decrease in pump performance was determined to be the combination of the specific N47/N57 cam profile with the 12 mm roller of the RP7 HDP. The other configurations found in the US market (N47/N57 with "RP6" and B57 with "RP7") do not have this unfavorable combination and, therefore, are substantially more robust. Therefore, for vehicles with RP6 HPP (prod. up to 12/16; low failure situation) an extended warranty program (10 years / 120,000 miles) was implemented.

With findings of the higher failure rates in the particularly conspicuous markets of the USA for vehicles with the N47/N57 engines and RP7 HDP (production starting from 01/17), an improvement measure was developed for this assembly (RP6+ HDP), and a safety recall was implemented.

Response 6(g) The reports included with this inquiry

There were no reports (NHTSA Vehicle Owner Questionnaires ("VOQs")) included with this inquiry.

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