Supplementary Reference report

Kenneth John Williams v Toyota Motor Corporation Australia Limited
(Federal Court proceedings no NSD1210/2019)

David P. Garrett
GARRETT & ASSOCIATES, INC.

Federal Court of Australia
No: NSD1210/2019

KENNETH JOHN WILLIAMS, Applicant

TOYOTA MOTOR CORPORATION AUSTRALIA LIMITED (ACN 009 686 097), Respondent

SUPPLEMENTARY REFERENCE REPORT OF DAVID P. GARRETT

Contents

A. INTRODUCTION

1. On 4 February 2021, I received a copy of Orders from the Court dated 19 January 2021. These Orders included Annexure E which set out Supplementary Questions on these proceedings. These Supplementary Questions were referred to me as Referee for the purposes of conducting an inquiry (**Supplementary Reference**) into the Supplementary Questions and to make a report in writing to the Court of my conclusions (**Supplementary Report**).

2. The Supplementary Questions are:

Design defect

1. *Are the Relevant Vehicles defective by reason of the fact that they are designed to rely principally on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF?*

2. *If Supplementary Question 1 is answered "yes", do the Relevant Vehicles suffer, or have they during the Relevant Period suffered, any of the Vehicle Defects and/or Vehicle Defect Consequences wholly or partly by reason of that defect?*

Fuel consumption

3. *Is the fuel consumption of the Relevant Vehicles increased and/or their fuel economy decreased, by reason of:*

   a. *the Vehicle Defects and/or Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the Referee's Report and, if so, by how much; and/or*

   b. *if Supplementary Question 1 is answered "yes", the Relevant Vehicles' reliance on Automatic Regeneration and Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF and, if so, by how much?*

2020 Countermeasures

4. *To what extent (if at all) is it established that the countermeasures implemented after the Relevant Period, have been and will continue to be effective in remedying:*

   a. *the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the Referee's Report;*

   b. *in the event that Supplementary Question 1 is answered "yes", that defect and any Vehicles Defects and Vehicle Defect Consequences suffered wholly or partly by reason of that defect; and/or*

   c. *any increase in fuel consumption and/or decrease in fuel economy found to exist in answer to Supplementary Question 3 above?*

3. This report sets out my opinions, with reasons, in relation to each question.

4. In accordance with FCR 28.66, I attach the following documents which I have had regard to in preparing this report:

   (a) Applicants' Statement of Contended Findings

(b) Respondent's Statement of Contended Findings

(c) Applicants' Response to the Respondent's Submissions in Chief

(d) Respondent's Response to the Applicants' Submissions in Chief

(e) TMCA Response to Referees Supplementary Questions

(f) Updated Respondent's Summary for the Referee in Response to Category 2(c)(v) of the Referee's Required Supplementary Reference Documents

5. This report references concepts and terminology set out in my earlier Reference Report in this matter.

6. Unless otherwise indicated, defined terms in this document are drawn from the Dictionary associated with my earlier Reference Report.

7. All of the opinions expressed in this report are based on my formal education, specialist training, professional experience, and knowledge of the subject matter as set out in Part C of the Reference Report.

8. Although I have considerable experience and expertise with vehicle emission regulations, certification, and compliance reporting (including warranty / defect reporting) and a deep knowledge and understanding of vehicle emission control systems, I am not a technical expert on the design of diesel emission control systems. For this reason, I engaged Mr. David Brown to provide a second opinion on certain issues. Mr. Brown is a diesel emission control systems expert whose knowledge and experience spans across a wider scope of engine and vehicle manufacturers and deeper understanding of diesel emission control methodologies than my own. My engagement of and the questions posed to Mr. Brown are attached as Annexure A. Mr. Brown's expert technical opinion is attached as Annexure B. A summary of Mr. Brown's professional experience and technical expertise is attached as Annexure C.

9. I confirm that the opinions are expressed in this report are my own, and that I reached them before reading or having regard to Mr. Brown's opinions. Nevertheless, Mr. Brown's opinions are consistent with my own, which gives me greater confidence in the conclusions I have reached.

B. FINDINGS - QUESTIONS 1 AND 2 (alleged design defect)

Design defect

1. *Are the Relevant Vehicles defective by reason of the fact that they are designed to rely principally on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF?*
2. *If Supplementary Question 1 is answered "yes", do the Relevant Vehicles suffer, or have they during the Relevant Period suffered, any of the Vehicle Defects and/or Vehicle Defect Consequences wholly or partly by reason of that defect?*

10. The Relevant Vehicles are not defective by reason of the fact that they are designed to rely principally on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF.

11. Passive regeneration is regeneration which occurs during normal operation of a vehicle without any intervention from or action by an engine's electronic control unit or module (**ECU** or **ECM**) to invoke a different engine operating mode in order to achieve regeneration.

12. There are two different types of passive regeneration of a DPF.[1] The first is passive regeneration through thermal oxidation. This occurs when the engine operation in the course of normal operation produces exhaust gas at the DPF inlet at temperature sufficient for thermal oxidation to occur. The operating conditions which can achieve passive regeneration through thermal oxidation are typically associated with sustained vehicle operation under heavy load. This is the type of passive regeneration I referred to in footnote 47 of my earlier Reference Report. While these operating conditions are within the scope of potential normal operation and use of the Relevant Vehicles, only those vehicles which are routinely heavily loaded and/or tow a heavy trailer are likely to experience passive regeneration through thermal oxidation.

13. Passive regeneration can also occur through NO2 oxidation. Passive regeneration through NO2 oxidation occurs where a minimum exhaust gas temperature is reached in the presence of a high concentration of NOx and a high NOx:PM ratio in the engine exhaust. Under certain favorable operating conditions with steady state or quasi-transient engine operation, passive regeneration

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[1] Contrary to the Applicants' claim in (Applicants' Statement at [7]), passive regeneration is NOT synonymous with NO2 oxidation. Passive regeneration is defined as regeneration which occurs without active initiation or control by the ECU. Passive regeneration can be achieved through either thermal oxidation or NO2 oxidation.

through NO2 oxidation can be continuous. Passive regeneration can be well-suited for large diesel engines used in heavy-duty trucks, busses, or non-road machinery which typically have high engine-out NOx and operate at high load factors and high exhaust gas temperature with steady state operation.[2]

14. Passive regeneration is inherently unsuitable as a primary method for DPF regeneration in light-duty trucks and SUVs such as the Relevant Vehicles because[3]:

(a) light-duty trucks and SUVs such as the Relevant Vehicles are developed to be compliant with low NOx limits associated with Euro 5 regulations;

(b) Exhaust Gas Recirculation (**EGR**) is the primary method to control NOx emissions from these engines. EGR generally results in increased PM emissions from the engine;

(c) the low NOx levels necessary to meet Euro 5 and the corresponding high PM result in a low NOx:PM ratio which is not sufficient for passive regeneration through NO2 oxidation;

(d) light-duty trucks and SUVs such as the Relevant Vehicles do not routinely achieve high exhaust gas temperatures during low-speed low-load driving such as city traffic or certification test cycles and cannot routinely experience passive regeneration through thermal oxidation;

(e) light-duty trucks and SUVs such as the Relevant Vehicles routinely experience highly transient engine operation in normal driving and during certification test cycles; and

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[2] The technical papers referenced in the Applicants' Statement of Contended Findings are not relevant to light-duty trucks and SUVs certified to comply with Euro 5 regulations, such as the Relevant Vehicles. Even so, the introduction section of each of these papers reminds the reader that exhaust gas temperature and composition are key enablers of passive regeneration by NO2 oxidation, and that passive regeneration is appropriate to be relied upon to prolong the interval between active regeneration events. See, for example, SAE 2013-01-0520 *Passive Regeneration Response Characteristics of a DPF System*: "Therefore it is important to understand the important parameters affecting DPF passive regeneration, identifying the range where passive regeneration can assist in making the active regeneration frequency interval longer."

[3] These same factors are well described in ASOC [sec. B4.2 paragraphs 29-33]

(f) the strategies employed to achieve compliance with Euro 5 NOx limits combined with normal operation and use of light duty vehicles limit the opportunities for passive regeneration.

15. The Respondent acknowledged in their description of the Toyota DPF system that, even though the Toyota DPF System is designed to rely primarily on automatic regeneration, passive regeneration through NO2 oxidation may occur.[4]

16. Due to the low levels of NOx produced by the engines certified to Euro 5 limits, the corresponding low NOx:PM ratio in the engine exhaust, and the duty cycles experienced by many light-duty trucks and SUVs, passive regeneration through thermal oxidation or NO2 oxidation is suitable to be relied upon only to assist in extending the interval between active regeneration events.

17. I am not aware of any passenger car, light duty truck, or SUV which has been certified to be compliant with Euro 5 emission regulations which relies principally on passive regeneration. My understanding is that DPF systems used in all Euro 5 compliant light duty diesel vehicles make opportunistic use of passive regeneration under favorable conditions but rely principally on active regeneration. This understanding is confirmed by the opinion provided by Mr. Brown.[5]

18. Toyota's reliance principally on "Active Regeneration" through Automatic Regeneration or Manual Regeneration engagement of a DPF Switch is consistent with the best practice DPF system designs used by OEMs and emission control system suppliers throughout the world for use on light duty vehicles designed to meet Euro 5 or more stringent emission standards. Reliance primarily on active regeneration is not a design defect but a necessary feature of light duty diesel vehicles to obtain Euro 5 Type Approval to in a cost-effective manner.

19. Because my answer to Supplementary Question 1. is "no", Supplementary Question 2. is irrelevant.

C. FINDINGS - QUESTION 3 (ALLEGED INCREASE IN FUEL CONSUMPTION)

Fuel consumption

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[4] Amended Defence [15.(a)(ii)] "… NOx Catalytic Oxidation **may** also occur in the DPF." [emphasis added]
[5] See Annexure B of this report at [2]

> 3. *Is the fuel consumption of the Relevant Vehicles increased and/or their fuel economy decreased, by reason of:*
>
> a. *the Vehicle Defects and/or Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the Referee's Report and, if so, by how much; and/or*
>
> b. *if Supplementary Question 1 is answered "yes", the Relevant Vehicles' reliance on Automatic Regeneration and Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF and, if so, by how much?*

20. Long term fuel consumption values suitable for making comparisons among vehicles, or to assess changes to fuel consumption of a single vehicle type, are reported in "Type Approval" reports as a weighted average based on:

    (a) fuel consumption when regeneration is not occurring;

    (b) distance travelled between regeneration events;

    (c) fuel consumption during regeneration; and

    (d) distance travelled to complete regeneration,

    tested under New European Driving Cycle (**NEDC**) driving conditions as prescribed in UNECE R101.[6]

21. I concluded in my earlier report that increased automatic regeneration frequency and/or duration was a consequence of the DPF system design core defect which was experienced in a subset of the Relevant Vehicles exposed to certain driving patterns.[7] However, I was not able to quantify any increase of fuel consumption of the Relevant Vehicles based on documents provided at that time. Additional documents have since been provided in response to my request for Supplementary Reference Documents.[8]

22. As noted in my earlier report, the most appropriate, technically accurate, and precise method to quantify any change in fuel consumption is to compare results:

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[6] UNECE Regulation No. 101 https://unece.org/transport/vehicle-regulations-wp29/standards/addenda-1958-agreement-regulations-101-120

[7] Reference Report at [43]; Annexure F Ref. 39(b)

[8] Referee's Required Supplementary Reference Documents, dated 24 February 2021

(a) from tests replicating Type Approval test as prescribed in UNECE R101 conducted on Relevant Vehicles when they are manifesting the Vehicle Defect Consequences (evidenced by, for example, excessive white smoke during automatic regeneration and/or an illuminated MIL with DTC P2463[9]) (**Affected Relevant Vehicles**); with

(b) results from the actual Type Approval reports corresponding to each vehicle type.

23. The Respondent has confirmed they have not conducted fuel consumption tests corresponding to UNECE R101 on Affected Relevant Vehicles.[10]

24. In the absence of actual test results from Affected Relevant Vehicles (as described in 22(a)), the most reliable estimate of the fuel consumption impact of increased automatic regeneration frequency and/or duration available is that calculated by:

(a) substituting the "distance without regeneration" and "distance with regeneration" values in the Type Approval studies with the real-world values for Affected Relevant Vehicles as recorded in the Toyota Fuel Consumption Study (**TFCS**)[11] (to reflect the higher regeneration frequencies in those vehicles); and

(b) keeping the "mean fuel consumption" rates in the Type Approval dataset (for normal driving and regenerative driving) constant. In my view, it is reasonable to assume that any increased fuel consumption in Affected Relevant Vehicles is a product of the increased frequency of regeneration rather than a general increase in fuel consumption during normal and regenerative driving, as the Applicant appears to accept.[12]

25. The above is consistent with the methodology suggested by the Applicants[13] and is also consistent with the opinion provided by Mr. Brown.[14] The Applicants' use of this methodology, however, appears to have used the fuel consumption and regeneration adjustment factor data from Type

[9] Diagnostic Trouble Code (DTC) P2463 (Soot Accumulation)
[10] 210823 TMCA Response to Referees Supplementary Questions 210820 (amended) at [2]
[11] See TJL.020.002.0037-ENG_amended2 (formulae), Sheet "Appendix 1, columns E and F
[12] Applicants' Statement of Contended Findings at [26(c)] and Applicants' Response at [14]
[13] Applicants' Statement of Contended Findings at [26]
[14] See Annexure B of this report at [3]

Approval reports on only a subset of Affected Relevant Vehicles[15], instead of the data from Type Approval reports applicable to each of the vehicles included in the Toyota Fuel Consumption Study.[16]

26. Using the methodology described above in paragraph 24, substituting the regeneration distances reported from individual vehicles in the Toyota Fuel Consumption Study for the corresponding regeneration distances used in the Type Approval reports for each of those vehicles, I estimate the increase in average fuel consumption for each of the vehicles in the TFCS (which were exhibiting white smoke) to be between 0 and 9%. Estimates for each of the individual vehicles are shown in the table below and my full workings are set out in the worksheet "*FC impact calculations.xls*" accompanying this report.

				NEDC FC (combined) values from Type Approval					**Vehicles reporting white smoke**				
VIN	Model	Engine	Trans	mean FC w/o regen (l/100km)	distance w/o regen (km)	mean FC during regen (l/100km)	distance during regen (km)	mean FC (l/100km)	distance w/o regen (km)	distance during regen (km)	mean FC (l/100km)	**FC increase, %**	**mean FC increase, %**
MR0HA3FS700040720	**Fortuner**	**1GD**	**6A**	8.4080	319	11.32726	22	8.6	1570	543	9.1582	**7%**	**6%**
				8.4080	319	11.32726	22	8.6	3118	994	9.1137	**6%**	
MR0HA3CD900377234	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	3131	400	8.4342	**2%**	**2%**
MR0HA3CD700406259	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	493	38	8.3167	**0%**	**1%**
				8.1150	319	10.93290	22	8.2968	4791	648	8.4507	**2%**	
MR0KA3CD401197224	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	3740	187	8.2492	**-1%**	**-1%**
				8.1150	319	10.93290	22	8.2968	5032	202	8.2238	**-1%**	
MR0EB3CB000443698	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	2212	613	8.7265	**5%**	**5%**
MR0HA3FS400029092	**Fortuner**	**1GD**	**6M**	7.6820	319	10.34955	22	7.8541	3330	1234	8.4032	**7%**	**7%**
MR0HA30D400378176	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	3834	328	8.3371	**0%**	**0%**
MR0KA3CD401197224	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	3740	187	8.2492	**-1%**	**-1%**
				8.1150	319	10.93290	22	8.2968	5032	202	8.2238	**-1%**	
				8.1150	319	10.93290	22	8.2968	2584	83	8.2027	**-1%**	
				8.1150	319	10.93290	22	8.2968	4820	131	8.1896	**-1%**	
MR0HA3CD300407182	Hilux	1GD	6A	8.1150	319	10.93290	22	8.2968	1195	81	8.2939	**0%**	**0%**
				8.1150	319	10.93290	22	8.2968	5657	340	8.2748	**0%**	
JTEBR3FJ80K020948	**Prado**	**1GD**	**6A**	8.0	352	10.36640	22	8.1392	5392	415	8.1691	**0%**	**0%**
MR0FB3CB000221067	Hilux	2GD	5M	7.0500	385	10.36335	22	7.2291	1201	814	8.3885	**16%**	**9%**
				7.0500	385	10.36335	22	7.2291	2502	307	7.4121	**3%**	
MR0HA3CD000399896	**Hilux**	**1GD**	**6A**	8.1150	319	10.93290	22	8.2968					**6%**
				8.1150	319	10.93290	22	8.2968	4134	1379	8.8199	**6%**	

27. While the simple average of the mean fuel consumption increase estimates of the vehicles in the Toyota Fuel Consumption Study is 3%, more than half of the vehicles are estimated to have no more than a marginal impact on fuel consumption[17], as I expected in my earlier report.[18] I note,

[15] Applicants' Statement of Contended Findings Footnote 34 (TCO.999.003.0006)
[16] Index - Respondent's Supplementary Documents for Referee (26 August 2021)
[17] Estimates of fuel consumption increase on 7 of the 12 vehicles was 2% or less
[18] Referee Report at [70]

however, that the driving patterns associated with the ECM downloads and the corresponding regeneration/non-regeneration distances reported in the TFCS are unknown and may not be directly comparable to the driving pattern of the NEDC used for the Fuel Consumption values from Type Approval, adding uncertainty to the estimates. Further, the ECM downloads reported in the TFCS do not represent a statistically significant sample of any vehicle type or model.

28. Nonetheless, the estimates do suggest that the Vehicle Defects likely have some negative impact of fuel economy in Affected Relevant Vehicles and this conclusion is further supported by the following additional considerations:

(a) the core defect and the impact of the core defect on regeneration frequency and duration (as discussed in my first report);

(b) the Applicant's affidavit evidence concerning the increased fuel use of his vehicle during periods in which it was emitting excessive white smoke; and

(c) records of customer complaints concerning increased fuel consumption in Relevant Vehicles.[19]

29. For the above reasons, the answer to the first part of question 3(a) is "yes".

30. As my observations at 27 above suggest, I am unable to answer the second part of question 3(a) based on the materials available to me. In particular, I cannot provide a reliable single estimate for increased fuel consumption to be applied globally for all Relevant Vehicles for the reasons identified in that paragraph and the following further reasons:

(a) as discussed in my first report, the level of increased regeneration affecting each of the Relevant Vehicles will be dependent on a range of variables, including the driving style and pattern of the individual driver; and

[19] As to (b) and (c), see Applicant's Statement of Contended Findings and the references cited there, particularly at [25]

(b) it appears likely that the driving style of the owners of the vehicles in the TFCS may explain much or all of the significant variation of fuel consumption results among the individual vehicles in my analysis of the TFCS as:

(i) the two vehicles with the highest increase in fuel consumption in the sample were the two manual transmission models; and

(ii) of the 10 remaining vehicles in the sample (all of which have automatic transmissions), 7 had only *de minimis* fuel consumption variations within +/-2% of the Type Approval result for that vehicle (with the remaining 3 showing increased fuel consumption of 5-6% from the Type Approval result).

31. Because my answer to Supplementary Question 1. is "no", Supplementary Question 3.b. is irrelevant.

D. FINDINGS - QUESTION 4 (ALLEGED COUNTERMEASURE INEFFICACY)

2020 Countermeasures

4. To what extent (if at all) is it established that the countermeasures implemented after the Relevant Period, have been and will continue to be effective in remedying:

a. the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the Referee's Report;

b. in the event that Supplementary Question 1 is answered "yes", that defect and any Vehicles Defects and Vehicle Defect Consequences suffered wholly or partly by reason of that defect; and/or

c. any increase in fuel consumption and/or decrease in fuel economy found to exist in answer to Supplementary Question 3 above?

32. The data included in the WINPAQ summary provided by the Respondent (updated on 25 August 2021) and its responses to my additional questions establish that the countermeasures implemented after the Relevant Period (**2020 Countermeasures**) have been effective and I expect will continue to be effective in remedying the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of my earlier report. As noted in my earlier

report, these countermeasures (ECM reflash, DPF Assembly replacement, Additional Injector Housing Assembly replacement) addressed the root causes of the core defect in the DPF System.[20]

33. The primary indicator that the 2020 Countermeasures have been effective is the statistic that only 1.13% (348 of the 30,875 Relevant Vehicles that had the 2020 field fix) have had any DPF-related reimbursement claims as of 31 July 2021[21], almost exactly one year after the 2020 Countermeasures were released to the Toyota dealership service departments.[22]

34. The 2020 Countermeasures appear to be equally effective both for vehicles produced from the start of vehicle production through the end of 2017 Model Year and vehicles produced since the 2018 Model Year Production change. The rate of DPF related claims on vehicles which had the 2020 Countermeasures for these groups of vehicles are 1.12% (344 of 30,466) and 0.98% (4 of 409), respectively.

35. Another indicator that the 2020 Countermeasures have been effective is that the Respondent has received no communications, escalations, or Dealer Product Reports with respect to any Relevant Vehicles experiencing Vehicle Defects and/or Vehicle Defect Consequences following the implementation of the 2020 Field Fix.[23]

36. Consistent with the above observations as to the apparent efficacy of the 2020 Countermeasures, as of 11 December 2020, the Applicant's Vehicle has not had a scheduled service since its 84 month / 140,000 recommended service maintenance on 22 October 2020, and had not had any unscheduled services to address any DPF-related or other abnormal issues since 23 July 2020.[24]

37. The primary indicator that the 2020 Countermeasures will continue to be effective is the data indicating that, while the number of Relevant Vehicles that have had the 2020 field fix has grown by 10,305 (3.9% of the Relevant Vehicles) from 28 February 2021 to 31 July 2021, the fraction of

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[20] Referee Report at [50]
[21] Rows (d) and (e) of Respondent's WINPAQ summary
[22] TAL.100.132.2005 ADSL 40/20 for vehicles from start of vehicle production through the 2017 Model Year; TAL.100.128.0011 TNF 18/20 for vehicles produced since the start of the 2018 Model Year.
[23] Respondent's Statement of Contended Findings at [49]
[24] Affidavit of K. Williams sworn 11 December 2020.pdf at [114 and 115]. The Affidavit at [212] indicates that the scheduled service on 22 October 2020 would need another unscheduled service would be needed "…to replace the DPF again.", yet the Applicant provides no indication that this additional DPF-related service was performed.

Relevant Vehicles that had the 2020 field fix and have had subsequent DPF-related reimbursement claims has remained relatively stable at approximately 1%.[25]

38. Because my answer to Supplementary Question 1. is "no", Supplementary Question 4.b. is irrelevant.

39. As to question 4(c), because the 2020 Countermeasures have been effective and I expect will continue to be effective in addressing the root causes of the core defect in the DPF System, any increase in fuel consumption associated with the Vehicle Defect Consequences will also have been eliminated. The fuel consumption of Relevant Vehicles which have received the 2020 Countermeasures should be consistent with that of Relevant Vehicles that have not had any DPF-related reimbursement claims.

40. I can be available to amend or supplement this report in the event any additional materials are presented for my review, if requested to do so by the Court.

Submitted by: Date: 31 August 2021

David P. Garrett
President and Principal Consultant
Garrett & Associates, Inc.

[25] Rows (d) and (e) of Respondent's WINPAQ summary: 1.02% (209 of 20,570 vehicles) for the data as of 28 February 2021 and 1.13% (348 of 30,875 vehicles) for the data as of 31 July 2021.

GARRETT
& ASSOCIATES, INC.

DAVID P. GARRETT
PRESIDENT AND PRINCIPAL CONSULTANT

August 13, 2021

Clear Air Consulting LLC
David B. Brown (by email)
3696 Sandbar Dr
Commerce Township, MI 48382

Re: Technical Consulting Services regarding Diesel Particulate Filter Systems

Dear Mr. Brown:

I have been retained to serve as a Referee in a matter before the Federal Court of Australia which involves certain light duty passenger vehicles equipped with diesel engines with diesel particulate filter (DPF) systems. Your expert technical opinion will be helpful in my response to Supplementary Questions posed to me by the Court.

The Relevant Vehicles are light duty pickup trucks and SUVs with 2.4L or 2.8L 4-cylinder diesel engines using common rail fuel injection, a variable nozzle turbocharger, and an intercooler. These vehicles were produced in the 2015-2018 timeframe and were certified to Euro 5 emission standards adopted in ADR79/03 and ADR79/04.

Please provide me your expert technical opinion on the following two topics:
1. DPF system regeneration; and 2. Fuel Consumption.

1. DPF System Regeneration

    a. What is the suitability of relying primarily on passive regeneration through NO2 oxidation for light duty diesel vehicles certified to Euro 5 emission standards?

    b. Is reliance primarily on passive regeneration through NO2 oxidation for light duty diesel vehicles certified to Euro 5 emission standards a common or prevalent DPF System Regeneration strategy?

2. Fuel Consumption
   What is a suitable methodology, based on good engineering judgement, to calculate the increase in fuel consumption if a vehicle experiences automatic/active DPF regeneration at a higher frequency and/or longer duration than documented during certification / Type Approval?

DRAFT

This letter will serve as an agreement between Garrett & Associates and you, an independent sub-contractor, to retain your expert services to assist in connection with this matter.

It is mutually agreed as follows:

1. Fees and Expenses. You shall be compensated for services and reimbursed for expenses in accordance with the terms specified in Attachment 1 to this letter. You shall submit your invoices for your work on this matter directly to me.

2. Confidentiality: You agree to treat all your communications with Garrett & Associates, as well as your work on this matter as confidential.
    a. You will not publish any article that discloses confidential or proprietary information related to this engagement.

    b. You agree that you will not share any draft material, or any notes, with any other person without explicit consent from Garrett & Associates.

3. Not an Agent. You are not an agent, employee, or legal representative of Garrett & Associates and are not authorized to do business in the name of or to obligate Garrett & Associates in any way.

4. Independent Contractor. Both Garrett & Associates and you agree that you are an Independent Contractor in the performance of duties under and related to this agreement. Accordingly, you shall be responsible for payment of all taxes including Federal, State, and local taxes arising out of your activities in accordance with this agreement.

5. Entire Agreement. Except as otherwise indicated, this letter reflects the entire agreement among you and Garrett & Associates for services related to the Matter.

Please sign this letter and return it to me to indicate acceptance of the terms set forth herein, and retain a copy for your records. We look forward to working with you again.

Sincerely,

David P. Garrett
President and Principal Consultant

Attachment
cc: Guy Donnellan – Level 22 Chambers

Agreed By: ________________________ Date: __________________
David B. Brown

Attachment 1

RATES AND TERMS

Effective October 1, 2020

Professional Consulting Services

Technical Consultant $ 385 / hr

All general office, clerical, and administrative support services included.

Travel Expense

Travel time in excess of 1 hour billed at 50% of applicable hourly consulting rate.

Reimbursement at cost of actual reasonable and customary travel expenses incurred.

Domestic air travel (i.e. destinations within North America: USA, Canada, Mexico) will be in Main Cabin / Coach Class.

Inter-continental air travel (i.e. destinations outside North America) will be in Business Class.

Travel expenses for lodging and incidental expenses may be billed using current GSA per diem rates.

Terms

Monthly invoices will set forth in reasonable detail the work performed during that month.

Documentation of travel costs (with corresponding receipts, as necessary) will be included with monthly invoices.

Payment in US Dollars ($) is due within 30 days of the invoice date, and may be executed by electronic funds transfer (ACH) or by check delivered through the U.S. Postal Service.

Contact Information

CLEAR AIR CONSULTING, LLC
David B. Brown, Principal +1-248-388-9832 Tel
3696 Sandbar Dr

DPF Regeneration Opinion

1. Background

1.1. The Relevant Vehicles are light duty pickup trucks and SUVs with 2.4L or 2.8L 4-cylinder diesel engines using common rail fuel injection, a variable nozzle turbocharger, and an intercooler. These vehicles were produced in the 2015-2018 timeframe and were certified to Euro 5 emission standards adopted in ADR79/03 and ADR79/04.

1.2. By way of introduction, light duty diesel engines/vehicles certified to EU5 emission standards were designed and developed to feature low engine NO_x emissions, accomplished with relatively high rates of cooled exhaust gas recirculation (**EGR**). These vehicles typically do not contain an active form of NO_x reducing aftertreatment within the exhaust system. Instead, they rely on low engine NO_x emissions to achieve regulatory compliance. This tends to increase engine particulate emissions **(PM**) since reductions in NO_x invariably lead to higher PM, other factors equal.

1.3. To achieve compliance with the EU5 PM regulations, a device known as a diesel particulate filter (**DPF**) is added in the exhaust system of EU5 compliant vehicles. The DPF traps PM with exceptional effectiveness. When the DPF fills with PM, it must be 'cleaned' using a regeneration process. There are two primary PM regeneration methods, 'passive', which involves PM oxidation by NO/NO_2 under limited conditions at relatively slow rates, and 'active', which incinerates the PM very quickly using higher than normal operating temperatures and available oxygen in the exhaust stream. Both methods may be used depending on operating circumstances.

1.4. In EU5 compliant vehicles, 'active' regeneration is typically necessary when vehicles are operated in urban or short trip, 'stop and go' driving patterns. This driving pattern is reflected in the test cycle used for EU5 certification, the New European Driving Cycle (**NEDC**), which contains significant operation with low vehicle speeds, and stop and go driving. These conditions favor low engine NO_x and low exhaust temperatures, which combine to create increased PM within the DPF, thereby requiring 'active' regeneration to maintain the PM at safe levels. The engine design strategy which enables meeting the EU5 regulations without NO_x aftertreatment results in low NO_x, but high PM, which in turn create the requirement for 'active' regeneration during both the certification / type approval process, and real-world vehicle use. However, if the same vehicle is operating on the freeway at speeds beyond 100 kph, it is often possible to rely on 'passive' regeneration whereby the incoming PM to the DPF is oxidized by the engine produced NO_x. This effect keeps the DPF from becoming full of PM, and in many cases would not require an 'active' regeneration to take place, providing the favorable exhaust conditions produced during the freeway driving are maintained.

1.5. It must be recognized that the engine design approach for EU5 light duty engines/vehicles is very different from older heavy-duty engines in many ways. For one, older heavy-duty engines often operated with much higher NO_x emission rates, using either very little, or even no EGR. These engines did not require a DPF either, since their PM rates were below applicable emission standards. Most of these engines would be installed into relatively heavy vehicles, or used in applications with high engine load factors, such as buses, trucks, etc. Many of these older heavy-duty engines, particularly those used in PM non-attainment areas like California, have been retrofitted with DPF systems to reduce PM emissions. Such retrofits are successful because they can rely entirely on continuous "passive" PM regeneration, enabled not only by the use and/or load profile of the vehicle application for thermal oxidation, but also by the relatively high engine NO_x emissions which enhance passive PM regeneration by NO_2 oxidation. Neither of these attributes, however, are present in engines designed to comply with light duty EU5 regulations, and hence reliance on passive regeneration cannot be accomplished for these products.

2. Technical opinion on DPF system regeneration;

1(a). What is the suitability of relying primarily on passive regeneration through NO_2 oxidation for light duty diesel vehicles certified to Euro 5 emission standards?

2.1. **Opinion**: All modern light duty diesel engines which I am aware of make use of both 'passive' and 'active' DPF regeneration modes. 'Passive' mode generally occurs when exhaust conditions are favorable that promote particulate matter (PM) oxidation. These conditions typically occur during higher vehicle speeds and engine loads, such as those present during freeway driving (Vehicle speed > 100 kph). Under these conditions, the engine produced NO_x is often higher than the PM rate, leading to oxidation of the PM by the NO_x. (Ideally, the NO_x to PM ratio will be 10x or greater).

2.2. Platinum precious metal, usually contained within the vehicles' diesel oxidation catalyst (**DOC**) and/or DPF, oxidizes engine produced NO into NO_2. NO_2 is more effective for PM oxidation than is NO, especially when temperatures are sufficient (250 to 400C), and the NO_2 is plentiful as compared to PM. During 'passive' PM oxidation, no additional steps are needed by the engine control system, and no additional fuel is consumed. Since the process is simple, automatic and penalty free, most manufacturers employ control strategies which track when exhaust conditions are favorable for 'passive' regeneration. These control strategies contain 'models' which estimate the PM content within the DPF. In this way, when vehicle operating conditions are favorable, the PM within the DPF is consumed, and the engine control system recognizes that it does not need to engage 'active' DPF regeneration, which consumes additional fuel.

2.3. However, it should be noted that 'passive' regeneration conditions are linked to specific vehicle operational conditions (which may or may not be present) and cannot be relied upon entirely in light duty vehicles. Low speed vehicle operation, particularly that associated with urban or stop and go driving, will not produce the conditions necessary for 'passive' PM oxidation. For vehicle types which regularly operate under these conditions, 'active' regeneration must be used.

2.4. 'Active' regeneration relies on the engine control system producing the necessary exhaust conditions which will enable rapid PM oxidation. These conditions require higher exhaust gas temperatures, typically in the 550 to 650 C range. (Note: under these high temperature conditions, the engine NO and/or NO_2 are not relevant, since PM will be oxidized by Oxygen, which is sufficiently present within diesel exhaust.) Generating these conditions requires active management of the engine's variable nozzle turbocharger (**VNT**), EGR, and fuel injection amounts/timing. While this process is engaged, there is a substantial increase in fuel consumption to create the necessary temperatures. The process is typically brief, at 10-20 minutes, but may be extended if interrupted due to the engine being shut off, or if the vehicle is operated at very low speeds (<40 kph) which can influence the ability of the control system to reach desired temperatures. Due to the fuel consumption penalty (and other factors not mentioned here to limit scope), 'active' regenerations are not preferred, but must be used when vehicle operation dictates.

2.5. Because vehicle operation cannot be tightly controlled, all light duty diesel engines which I am aware of employ both 'passive' (to take advantage of the benefits cited) and 'active' DPF regeneration strategies. It is not suitable to rely primarily or only on 'passive' PM oxidation, since the required conditions are not guaranteed to exist for many vehicle operational situations.

1(b). Is reliance primarily on passive regeneration through NO_2 oxidation for light duty diesel vehicles certified to Euro 5 emission standards a common or prevalent DPF System Regeneration strategy?

In my opinion, all manufacturers would place a preference on 'passive' regeneration, when conditions permit. This could be construed to imply that using 'passive' DPF regeneration is a common or prevalent strategy. However, all manufactures should be aware that 'passive' regeneration occurs under limited engine operation circumstances which cannot be routinely guaranteed. All manufacturers (which I am aware of), employee both 'passive' and 'active' strategies within the engine control system, preferring to rely on 'passive' regeneration when feasible, and when not, engaging 'active' regeneration strategies.

3. Technical opinion on DPF system regeneration related to Fuel Consumption;

2. What is an appropriate methodology, based on good engineering judgement, to calculate the increase in fuel consumption if a vehicle experiences automatic/active DPF regeneration at a higher frequency and/or longer duration than documented during certification / Type Approval?

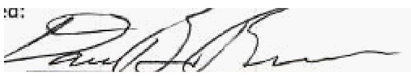
3.1. In my opinion, one approach would be to leverage the information generated during certification/type approval, which should be readily available. During type approval, emissions and fuel consumption are measured over the NEDC driving cycle, with and without DPF regeneration. Additionally, the DPF regeneration interval (or frequency) are reported. The frequency, and the emissions/fuel consumption with and without DPF regeneration are used to determine the emission and fuel consumption penalty, using a simple averaging calculation.

3.2. If a different DPF regeneration frequency were assumed, or known, it would be straight forward to estimate the difference. In the case of more frequent DPF regenerations, average vehicle fuel consumption would increase, and this value could be compared to the certification/type approval baseline.

3.3. The primary challenge would be to determine the frequency of active DPF regenerations, and how representative these would be for a given vehicle population as a whole. Certainly, there will be 'worst case' drivers whom have higher than expected DPF regenerations, potentially due to exclusive vehicle use in urban settings, for example. Other drivers may have no increase, or potentially less active DPF regenerations than reported during certification/type approval, if they primarily operate the vehicle on highways.

3.4. Most diesel engine control systems contain within the engine controller a counter which tracks the number of 'active' regenerations, and vehicle distance travelled. One method to determine the DPF regeneration interval would be to collect the number of 'active' regenerations from a statistically relevant number of vehicles, representing a broad range of vehicle users. This data could be then used to generate likely DPF regeneration intervals which could be leveraged with the existing certification/type approval information to assess fuel consumption impact using DPF regeneration frequencies which differ from those used during certification/type approval.

Recoverable Signature

X 

David Brown, Principle
Clear Air Consulting August 28, 2021
Signed by: David Brown

DAVID B. BROWN
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CAREER SUMMARY

Over thirty-five years of increasingly responsible positions in automotive powertrain development, with an emphasis on emission control technologies (gas & diesel) and alternative fuels.
Key strengths include: Technology management & planning; Leading high-performance technical teams; Program management and coordination; Powertrain controls development and calibration; Diesel engine emissions & aftertreatment; Gasoline engine emission control; Alternative fuels; Global program experience and extensive international travel.

PROFESSIONAL EXPERIENCE

2019 – present **Clear Air Consulting, LLC** Commerce Township, MI
Principal
Offering consulting services for automotive emission control technology, gasoline or diesel, including regulatory interpretation & compliance requirements.

2010 – 2018 **General Motors LLC**, Milford, MI; Propulsion System – Diesel Calibration Group
GM Technical Fellow, Diesel Emission Controls
Responsible for establishing and leading strategic directions for corporate diesel emission control systems

- Developed emission control system bill of materials/design requirements
- Established performance specifications & emission compliance guidelines
- Supported execution of product plans on global basis within program teams
- Provide concise recommendations to senior management / planning teams
- Provide leadership, steering & coaching for highly motivated engineers & scientists

2001 – 2009 **General Motors Corporation**, Milford, MI; Advanced Powertrain System Controls
Senior Staff Project Engineer, Light Duty Diesel Emission Control
Senior engineer leading multi-functional team to develop diesel emission control systems for light duty vehicles

- Supervised technical team developing emission systems, including Lean NOx Trap, Urea Selective catalytic reduction & Diesel Particulate Filter
- Responsibilities included project management, budget planning, employee performance reviews
- Coordinated multiple global programs/projects both internally and externally with engineering firms

1993 - 2000 **General Motors Corporation**, Warren, MI; Advanced Powertrain
Staff Project Engineer, Future Emissions Control Technology
Lead engineer for the development of advanced gasoline engine emission control technologies .

- Responsible for aftertreatment system development to enable ULEV and SULEV emission capability
- Lead coordination of global technology development program for lean NOx catalysts
- Responsible for transfer of technology and knowledge to operating divisions for implementation

1984 - 1993 **General Motors Corporation**, Warren MI; Advanced Engineering Staff
Senior Project Engineer, Advanced Product Engineering, Alternative Powertrains
Development of alternative fuel powertrains, including methanol and flexible fuel capability

- Led development of 20 flexible fuel vehicles for governmental evaluation
- Developed and implemented engine control algorithms, including calibrations

1982 - 1984 **General Dynamics Land Systems Division**, Centerline, MI
Associate Engineer, Prototype Development

ACCOMPLISHMENTS / AFFILIATIONS

- 52 U.S. Patents, 8 defensive publications
- Twice recipient of “Boss Kettering Award” (GM’s highest technical award) and received “Most Valuable Colleague” award.
- 6 technical paper publications , 37 year member Society of Automotive Engineers

EDUCATION

Oakland University, Rochester, MI
Master of Science in Mechanical Engineering

University of Michigan, Ann Arbor, MI
Bachelor of Science in Mechanical Engineering

D

Kenneth John Williams & Anor v Toyota Motor Corporation Australia Limited

APPLICANTS' STATEMENT OF CONTENDED FINDINGS

A INTRODUCTION

1 This statement of contended findings (**Statement of Findings**) is submitted pursuant to Order 6(g) made by the Court on 19 January 2021 (**Orders**) and Rule 28.65(7) of the *Federal Court Rules 2011* (Cth).

2 The Supplementary Reference requires the Referee to conduct an inquiry into the Supplementary Questions at Annexure E of the Orders and make a report to the Court. The Supplementary Questions relate to three broad topics:

(a) whether the Relevant Vehicles[1] are defective in design, by reason of the fact that they are designed to rely principally on Active Regeneration, rather than Passive Regeneration, to regenerate the DPF (in addition to being defective for the reasons already stated in the Referee's Report);

(b) whether Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences consume additional fuel as a result of these defects and/or consequences, and if so, how much; and

(c) whether countermeasures introduced by Toyota after the Relevant Period have been, and will continue to be, effective in remedying the Vehicle Defects and Vehicle Defect Consequences.

3 The Applicants submit that the Referee should find that:

(a) the Relevant Vehicles are defective in design by reason of the fact that they are designed to rely principally – indeed, almost exclusively – on Active Regeneration to regenerate the DPF;

(b) Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences do consume additional fuel as a result of these defects and/or consequences, consuming at least 5.2% more fuel than they otherwise would if they were free from the Vehicle Defects and/or Vehicle Defect Consequences; and

(c) the countermeasures introduced by Toyota after the Relevant Period have not been and/or will not continue to be effective in remedying the Vehicle Defects and/or Vehicle Defect Consequences (or alternatively, it has not been established that these countermeasures have been and will continue to be effective).

4 The Applicants' submissions in support of these contended findings are set out below.

B DESIGN DEFECT

B1 Answers to Questions 1 and 2

5 For the reasons set out in paragraphs 6 to 15 below, the Applicants submit that the Referee should answer each of Supplementary Questions 1 and 2, "*yes*".

[1] Unless otherwise defined, capitalised terms used in this Statement of Findings have the meanings given to them in the Dictionary at Schedule 1 of Annexure E of the Referee's report dated 15 October 2020 (**Referee's Report**) and/or in the Applicants' statement of findings for the initial reference dated 24 July 2020 (**Applicants' First Statement**).

B2 Applicants' submissions in support (Question 1)

6 It has already been determined by the Referee (and accepted by the Respondent by its adoption of the Referee's Report) that the Relevant Vehicles do not achieve meaningful NO_2 Oxidation or Passive Regeneration.[2] The Respondent's position is that this does not render the Relevant Vehicles defective because it reflects a deliberate design choice made by Toyota; that is, Toyota has deliberately designed the Relevant Vehicles to rely principally on Active Regeneration to regenerate the DPF in the Relevant Vehicles.[3] The Applicants submit that the Relevant Vehicles are defective by reason of this design choice for the reasons set out below. Put differently, if the Relevant Vehicles are defective by reason of the way in which the DPF System operates, it is no defence for the Respondent to say that they are *designed* to be defective.

7 In light duty diesel vehicles, NO_2 Oxidation typically occurs when exhaust produced by the engine is projected through the DPF at a temperature of approximately 300ºC.[4] This is within the range of temperatures of exhaust produced during normal operation of light duty diesel vehicles (200-400ºC) and is significantly lower than the exhaust temperatures required to achieve Thermal Oxidation (which typically around 600ºC). NO_2 Oxidation thus occurs during normal operation of light duty diesel vehicles in ordinary driving conditions, whereas Thermal Oxidation does not. In the Relevant Vehicles, in all but the most extreme driving conditions, Thermal Oxidation will only occur during Active Regeneration.[5]

8 Passive Regeneration is synonymous in the automotive industry with NO_2 Oxidation because it utilises chemical reactions which necessarily take place during normal operation of the vehicle, without any further intervention by the vehicle or its operator. Passive Regeneration thereby "*require[s] no integration with the engine, no source of energy other than the exhaust gases themselves, and no complicated control systems*".[6] DPF systems are typically configured to optimise NO_2 Oxidation, and therefore Passive Regeneration.

9 A key difference between Passive Regeneration and Active Regeneration is that Active Regeneration requires the injection of diesel fuel into the exhaust of the vehicle to effect Regeneration, whereas Passive Regeneration does not. The exercise of injecting diesel fuel into the exhaust of the vehicle is fraught. To be undertaken effectively, the injected diesel fuel must be atomised (ie, separated into very small particles) in order for it to vapourise and combust in the DOC. The atomisation of diesel fuel is difficult to achieve, due to the high viscosity of diesel. If the injected diesel fuel does not atomise properly, it is prone to combine with particulate matter in the DOC and/or DPF to form a thick, sooty residue, which in turn is prone to clog and block the DOC and DPF.[7]

10 By reason of that key difference, Passive Regeneration has inherent advantages over Active Regeneration. In particular, Active Regeneration (as compared to Passive Regeneration) is more likely to lead to, or exacerbate, the Vehicle Defects described in the Referee's Report at [8]. Specifically:

[2] Referee's Report, footnote 47.

[3] Respondent's Defence at [23(b)(i)], [39(a), (b) and (c1)]; Letter from BLCA to CU dated 26 February 2021; Letter from CU to BLCA dated 3 March 2021.

[4] Bai, S.; Tang, J.; Wang, W. and Li, G., Soot loading estimation model and passive regeneration characteristics of DPF system for heavy-duty engine, Applied Thermal Engineering, 2016, Vol 100, pp 1292-1298.

[5] Referee's Report, footnote 47.

[6] Kotrba, A; Gardner, T.P.; Bai, L.; Yetkin, A.; Passive Regeneration Response Characteristics of a DPF System, SAE International, 2013.

[7] TAL.001.534.7823 at .7823 and .7825; TAL.001.538.7482 at .7514 and .7521.

(a) Active Regeneration is more likely to result in the formation of deposits on the DOC surface or coking within the DOC than Passive Regeneration;

(b) By reason of (a) above, Active Regeneration is more likely to prevent the DPF filter from effectively regenerating than Passive Regeneration; and

(c) Active Regeneration is more likely to lead to excessive white smoke and foul-smelling exhaust during Regeneration and/or indications from the engine's onboard diagnostic (OBD) system that the DPF is "full" than Passive Regeneration.

11 Additionally, Active Regeneration (as compared to Passive Regeneration) results in increased fuel consumption (all else being equal), which is necessarily a consequence of Active Regeneration requiring the injection of additional fuel into the exhaust to effect Regeneration.[8]

12 By reason of the inherent advantages of Passive Regeneration over Active Regeneration, the DPF system should be designed to utilise Passive Regeneration wherever possible, avoid frequent Active Regeneration and utilise Active Regeneration as a "*backstop*" to periodically assist Regeneration if required. In this way a well-designed DPF system will effectively combine Passive Regeneration and Active Regeneration.[9]

13 In relation to the Relevant Vehicles, rather than seeking to achieve such a balanced combination and/or configure the DPF System to optimise NO_2 Oxidation and Passive Regeneration in order to harness their comparative advantages, Toyota ignored these mechanisms entirely, choosing instead to rely principally – indeed, almost exclusively – on Active Regeneration.

14 The Applicants submit that the Relevant Vehicles are defective by reason of this choice because it necessarily increases the risk (compared to alternative designs) of the Relevant Vehicles developing the adverse characteristics which have in fact manifested, including the DOC and DPF becoming blocked and not functioning effectively and increased fuel consumption.[10] In the language of the US EPA regulatory definition cited at [34] of the Referee's Report, this choice was "*an aspect of design… in one or more emission-related … systems … which adversely affects or prevents [an] element of design of the emission control system… from functioning properly*".

B3 Applicants' submissions in support (Question 2)

15 The Applicants do not submit that the design defect described in Section B2 above is the sole cause of any of the Vehicle Defects and Vehicle Defect Consequences suffered by the Relevant Vehicles. Even if an alternative DPF System design had been adopted by Toyota, the Relevant Vehicles would have suffered the Vehicle Defects and Vehicle Defect Consequences identified in the Referee's Report for the reasons stated therein. However, for the reasons submitted in paragraph 14 above, the design defect contributed to and/or exacerbated each of the Vehicle Defects and Vehicle Defect Consequences suffered by the Relevant Vehicles, including the increased fuel consumption described in Section C below, by increasing the likelihood of the Relevant Vehicles developing these adverse characteristics.

[8] Certification materials for the Relevant Vehicles indicate the vehicles use an additional 2.3L/100km when regenerating compared to when not regenerating: see paragraph 18 below.

[9] Kotrba, A.; Gardner, T.; Bai, L. and Yetkin, A. Passive Regeneration Response Characteristics of a DPF System, SAE International, 2013; Srinivasan, A. and Price, K., Consolidation of DOC and DPF Functions into a Single Component, SAE International, 2019.

[10] Referee's Report, Annexure F, Refs 39(f), 39(h), 39(i), 41(a), 41(b), 41(c), 41(d), 41(e), 41(g), 41(h), 41(k).

C FUEL CONSUMPTION

C1 Answers to Questions 3(a) and (b)

16 For the reasons set out in paragraphs 17 to 30 below, the Applicants submit that the Referee should answer:

(a) Supplementary Question 3(a), "*yes*", in the amount of at least 5.2%; and

(b) Supplementary Question 3(b), "*yes*".

C2 Applicants' submissions in support (Question 3(a))

C2.1 Relevant Vehicles consume more fuel during Regeneration

17 It is uncontroversial that the Relevant Vehicles consume more diesel fuel during Regeneration compared to when they are not regenerating (all other things being equal). One of the reasons this is necessarily the case is that (a) the vehicles rely principally on Active Regeneration to regenerate the DPF and (b) Active Regeneration involves the injection of additional fuel into the exhaust by the Additional Injector to raise the temperature of the exhaust to the level necessary to achieve Thermal Oxidation.

18 This increased fuel consumption during Active Regeneration is reflected in the certification materials for the Relevant Vehicles which indicate that the Relevant Vehicles consume fuel at a rate of 10.08 L/100km during Regeneration[11] compared to 7.78 L/100km when not regenerating.[12]

C2.2 Vehicle Defects and Vehicle Defect Consequences cause Excess Active Regeneration

19 It has already been established that the Relevant Vehicles suffer Vehicle Defects and Vehicle Defect Consequences which include that: (a) the DOC and DPF become blocked and do not function effectively; (b) Regeneration and the DPF System are not effective to prevent the DPF from becoming blocked; and (c) unoxidized fuel flows through the DPF and is emitted as white smoke.[13]

20 As explained further in paragraphs 21 to 23 below, Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences experience more frequent and longer Active Regeneration than they would absent these defects (**Excess Active Regeneration**). Indeed, Toyota appears to acknowledge (through its adoption of the Referee's Report) that design defects in the DPF System cause Automatic Regeneration to occur more frequently than it otherwise would in some of the Relevant Vehicles.[14]

21 This is unsurprising. Logically, a system which serves the function of clearing particulate matter from the DPF will be required to operate more frequently, and for longer durations, if the system is not functioning effectively (and if the DPF is becoming blocked with particulate matter more frequently).

22 As explained further in paragraph 28 and Annexure A below, this Excess Active Regeneration was also confirmed in an internal study conducted by Toyota in September 2019 (**Toyota Fuel**

[11] TCO.999.003.0006 at .0006 (row entitled 'Mean emission during cleaning M_{ri}', column entitled 'Fuel Consumption (l/100km) combined'.

[12] TCO.999.003.0006 at .0006 (row entitled 'Mean emission between cleaning M_{si}', column entitled 'Fuel Consumption (l/100km) combined').

[13] Referee's Report, Annexure F, Refs 39(f), 39(h), 39(i), 41(a), 41(b), 41(c), 41(d), 41(e), 41(g), 41(h), 41(k).

[14] Referee's Report, Annexure F, Ref 39(b), Referee's Finding.

Consumption Study). The Toyota Fuel Consumption Study involved analysis of the amount of Active Regeneration experienced, and fuel consumed, by approximately 13 Relevant Vehicles manifesting Vehicle Defects and/or Vehicle Defect Consequences (such as emitting white smoke and displaying the P2463 diagnostic trouble code) (**Toyota Study Vehicles**).[15] Internal Toyota documents confirm that the Toyota Study Vehicles are real consumer vehicles from around Australia experiencing manifestations of the Vehicle Defects and Vehicle Defect Consequences identified in the Referee's Report.[16] The Toyota Fuel Consumption Study found that on average, the Toyota Study Vehicles were regenerating 16.4% of the time,[17] compared to the figures of between approximately 5.4% and 6.5% presented in the certification materials for the vehicles.[18]

23 This Excess Active Regeneration is also evidenced in multiple internal Toyota documents which describe the Relevant Vehicles experiencing a self-perpetuating and reinforcing cycle in which:

(a) deposits blocking the face of the DOC and coking within the DOC prevent or impede the exhaust flowing through the DOC from reaching the temperature necessary to achieve Thermal Oxidation of particulate matter captured in the DPF, thereby prolonging the time needed to regenerate the DPF (and thus the duration of each Regeneration);[19]

(b) the Additional Injector injects additional fuel into the exhaust for a longer period of time, in order to increase the exhaust temperature to the level necessary to achieve Thermal Oxidation;[20]

(c) the additional fuel injected by the Additional Injector results in additional blockage and coking of the DOC;[21] and

(d) by reason of (c), the problems in (a) and (b) are exacerbated (ie, the duration of each Regeneration is further prolonged, leading to further blockage and/or coking).[22]

C2.3 Excess Active Regeneration necessarily causes increased fuel consumption

24 It necessarily follows from the matters outlined in sections C2.1 and C2.2 above that Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences consume more fuel than they would but for the Vehicle Defects and/or Vehicle Defect Consequences from

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[15] TJL.020.002.0037 at sheet 9 (counting from the left) (**Sheet 9**), row 1 and column T. The proper translated name of Sheet 9 is '*Average Fuel Consumption of Defective Vehicles_Additional Paramaters_Supplement 1*' (see the 'sheet name translations' schedule provided to Counsel Assisting on 7 April 2021), but the shorthand '*Appendix 1*' has been used in the spreadsheet for convenience. The original (Japanese) version of TJL.020.002.0037 appears here.

[16] See by way of example: TCO.005.002.3326 (in respect of vehicles with VINs ending 720, 234, 259, 224, 698 and 092); TAL.001.279.6492 at sheet 1, row 4 (in respect of vehicle with VIN ending 720); TCO.005.002.7846 at sheet 1, column C, D and V (in respect of vehicles with VINs ending 224, 176, 182, 948, 067 and 896).

[17] Measured in terms of the distance the vehicles travelled while undergoing Active Regeneration as a proportion of the total distance travelled. TJL.020.002.0037 at Sheet 9, column J (simple average of row 4 to 24).

[18] TCO.999.003.0006: Calculated by reference to the number of operating cycles required for Regeneration as a proportion of the sum of the number of operating cycles between Regeneration events and the number of operating cycles required for Regeneration.

[19] Referee's Report, [47(b)(iii)], [55(b)], [Annexure F, 41(e)]; TAL.001.478.6005 at sheet 3, row 19; TAL.001.299.5495 at .5495; TCO.005.002.3388 at _0012; TAL.001.276.3387 at .3387; TAL.001.281.3264 at .3264; TJL.020.002.0037 at sheet 1, row 10 to 11 (sheet 1 proper name: '*Study of Worst Fuel Consumption Deterioration Values_Cover Page 5*'; shorthand: '*Cover Sheet 5*') (**Sheet 1**) and at sheet 5, row 10 to 11 (sheet 5 proper name: '*Study of Worst Fuel Consumption Deterioration Values_Cover Page 2*'; shorthand: '*Cover Sheet 2*') (**Sheet 5**).

[20] TAL.001.478.6005 at sheet 3, row 19; TAL.001.299.5495 at .5495; TAL.001.287.7921 at .7941 and .7943; TAL.001.144.5165 at .5169; TAL.001.287.2421 at _0012 and _0014; TAL.001.286.1096 at .1109; TAL.850.353.0100 at .0100.

[21] TAL.001.277.3471 at .3490; TAL.001.478.6199 at .6200 and .6202; TAL.001.447.5035 at sheet 1 ('Jumonsho').

[22] Referee's Report, [8]; TAL.001.372.4751 at .4751; TAL.001.144.5165 at .5169; TAL.001.287.7921 at .7941; TAL.001.287.2421 at _0012 and _0014; TAL.001.534.7823 at .7826; TAL.001.286.1096 at .1109; TCO.005.002.3388 at _0010 and _0012; TAL.850.353.0100 at .0100; TAL.001.281.3264 at .3264; TAL.001.277.3471 at .3482; TCO.005.004.3064 at .3064; TAL.001.307.4190 at .4201; TAL.001.478.6199 at .6200 and .6202.

which they suffer and the answer to Supplementary Question 3(a) is "*yes*".

25 This logical consequence is corroborated by Internal Toyota documents which evidence multiple consumer complaints about the regeneration frequency and duration[23] and increased fuel consumption of Relevant Vehicles.[24] The First Applicant, Mr Williams, himself deposes to having experienced these phenomena.[25]

C2.4 Quantifying this increased fuel consumption

26 The Applicants submit that the simplest, most effective and likely least contentious way of quantifying this additional fuel consumption is to:

(a) determine the amount of Active Regeneration experienced by Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences (measured as the proportion of the total distance travelled by the vehicles during which they were undergoing Active Regeneration);

(b) compare this to the amount of Active Regeneration Toyota's certification materials indicate Relevant Vehicles should be experiencing (to determine the amount of Excess Active Regeneration experienced by Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences); and

(c) use the fuel consumption rates specified in Toyota's certification materials referred to in paragraph 18 above to calculate the amount of extra fuel consumed by the vehicles due to the Excess Active Regeneration they experience.

27 This is a similar analysis to that undertaken in the Toyota Fuel Consumption Study. As expanded in section C2.5 below, this study determined that Excess Active Regeneration (as described in paragraph 22 above) led to an average increase in fuel consumption across the Toyota Study Vehicles of at least 5.2%.[26]

C2.5 Toyota Fuel Consumption Study

28 Toyota has produced 9 spreadsheets which relate to the Toyota Fuel Consumption Study (**Study Spreadsheets**).[27] Based on the Applicants' review of the Study Spreadsheets, it appears that:

(a) the Toyota Fuel Consumption Study involved Toyota analysing the amount of Active Regeneration experienced and fuel consumed by the Toyota Study Vehicles (measured in terms of the proportion of the total distance travelled by the vehicles during which they were undergoing Active Regeneration);[28]

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[23] See for example: TAL.001.319.2557; TAL.400.050.0550; TAL.200.115.1320; TAL.100.031.1285.

[24] TAL.001.319.2557; TAL.400.050.0550; TAL.200.023.4938; TAL.200.023.4914; TAL.001.512.6360; TAL.200.132.0111; TAL.400.050.1291; TAL.200.115.1320; TAL.200.024.0913; TAL.001.618.2472; TAL.001.616.4597; TAL.400.053.6665; TAL.001.477.5886; TAL.001.274.4330; TAL.100.037.0001.

[25] Affidavit of Kenneth John Williams dated 11 December 2020 at paragraphs 117 to 128, 131, 135 to 136, 138 to 140, 144, 146, 149 to 150, 172, 181, 183, 189, 204, 221 and 240 to 244.

[26] TJL.020.002.0037 at Sheet 9, column L (simple average of rows 4 to 24; see further paragraphs 1 to 4 of Annexure A below).

[27] TJL.020.001.0004; TJL.020.001.0018; TJL.020.001.0019; TJL.020.002.0031; TJL.020.002.0034; TJL.020.002.0036; TJL.020.002.0037; TJL.020.002.0038; TJL.020.002.0042. From the Respondent's index of documents for the Supplementary Reference it appears TJL.020.002.0037 is the most complete 'final' Study Spreadsheet and is thus the primary Study Spreadsheet referenced by the Applicants in these submissions.

[28] See paragraph 22 above.

(b) the intended output from the Toyota Fuel Consumption Study was an estimate of "*the worst value for fuel consumption deterioration that could be experienced by customers who have experienced white smoke (DOC end face clogging)*';[29]

(c) the "*thinking*" behind the Toyota Fuel Consumption Study was:

(i) "*at the point in time when the customer has become aware of white smoke, there is a fuel consumption deterioration of a level that the customer can experience. (Around 10% or more)*"; [30] and

(ii) to "*estimate the rate of fuel consumption deterioration based on the mechanism of its occurrence*", with the "*mechanism of occurrence*" being described by Toyota as "*(1) catalyst degradation → [(2)] clogging of end face → (3) extension of PM regeneration time → [(4)] white smoke generation*", and with "*deterioration of fuel consumption*" being stated to occur "*owing to the occurrence of phenomenon (3) above*";[31]

(d) this thinking is similar to the approach endorsed in paragraph 26 above, in that it involves measuring the additional Active Regeneration experienced by the Toyota Study Vehicles as a result of Vehicle Defects and/or Vehicle Defect Consequences such as DOC clogging, and using this to calculate the additional fuel consumed by these vehicles;

(e) raw vehicle data for the Toyota Study Vehicles was initially used to calculate excess Active Regeneration and fuel consumption deterioration in these vehicles on around 16 September 2019, with this data being set out in sheet 9 of TJL.020.002.0037 (**Sheet 9**) and showing that:[32]

(i) on average, the Toyota Study Vehicles were regenerating 16.4% of the time,[33] compared to the figures of between approximately 5.4% and 6.5% presented in the certification materials for the Relevant Vehicles;[34] and

(ii) the average fuel consumption deterioration across the Toyota Study Vehicles was at least 5.2%.[35] The Applicants submit that the simplest way to corroborate and quantify the increased fuel consumption experienced by Relevant Vehicles manifesting the Vehicle Defects and Vehicle Defect Consequences is by reference to this average fuel consumption deterioration across the Toyota Study Vehicles;

(f) Toyota conducted further calculations based on the data in Sheet 9:[36] (a) firstly, to seek to exclude the asserted influence of short trips on fuel consumption deterioration, which

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[29] TJL.020.002.0037 at sheet 8, row 4 (sheet 8 proper name: *'Estimate of Worst Values for Fuel Consumption Deterioration_Cover Page'*; shorthand: *'Cover Sheet'*) (**Sheet 8**).

[30] TJL.020.002.0037 at Sheet 8, row 7.

[31] TJL.020.002.0037 at Sheet 8, rows 9 to 12.

[32] This analysis is reproduced consistently across the Study Spreadsheets (see for example: TJL.020.002.0034, sheet 2 (sheet 2 proper name: *'Average Fuel Consumption of Defective Vehicles_Additional Parameters_Supplement 1'*; shorthand: *'Appendix 1'*); TJL.020.002.0038, sheets 8 (sheet 8 proper name: *'Estimate of Worst Values for Fuel Consumption Deterioration_Cover Page'*; shorthand: *'Cover Sheet'*) to 13 (*'Regeneration Time Distribution'*); TJL.020.002.0036, sheets 8 to 13; TJL.020.001.0019, sheets 7 to 12; TJL.020.001.0018, sheets 5 to 10; TJL.020.001.0004 at sheets 7 to 12) (each of these sheets bearing the same names as the equivalent sheets in TJL.020.002.0038).

[33] Measured in terms of the distance the vehicles travelled while undergoing Active Regeneration as a proportion of the total distance travelled. TJL.020.002.0037 at Sheet 9, column J (simple average of row 4 to 24).

[34] TCO.999.003.0006: Calculated by reference to the number of operating cycles required for Regeneration as a proportion of the sum of the number of operating cycles between Regeneration events and the number of operating cycles required for Regeneration.

[35] TJL.020.002.0037 at Sheet 9 column L (simple average of rows 4 to 24; see further calculations at paragraphs 1 to 4 of Annexure A below).

[36] See paragraph 5 in Annexure A below.

resulted in the calculation of an alternative average fuel consumption deterioration percentage of 8.8%;[37] (b) secondly, to calculate the "*Worst rate of fuel consumption deterioration at the point in time when customers became aware of white smoke*" (17%);[38] and (c) thirdly, to calculate a "*usage process average*", described as the "*average rate of fuel consumption deterioration up until the point in time when customers became aware of white smoke*" (8.5%);[39] and

(g) after these initial calculations were reported to a Toyota "*Head of Department*", alternative methodologies were applied on around 19 and 20 September 2019 [40] which resulted in Toyota calculating estimated fuel consumption increases in vehicles in which white smoke had been noticed of 13.7%,[41] 11.4%[42] and 8.3%.[43]

29 A more detailed guide to the analysis and calculations in the Study Spreadsheets is set out at Annexure A to these submissions to assist the Referee.

C3 Applicants' submissions in support (Question 3(b))

30 Given that Active Regeneration involves the injection of additional fuel into the exhaust to seek to achieve Thermal Oxidation, it is necessarily the case that a design which relies principally on Active Regeneration will require the consumption of more fuel than a more balanced design of the kind described in paragraph 12 above (all other things being equal).

D 2020 COUNTERMEASURES

D1 Answers to Questions 4(a), (b) and (c)

31 For the reasons set out in paragraphs 32 to 40 below, the Applicants submit that in answer to Supplementary Questions 4(a), (b) and (c), the Referee should find that the countermeasures introduced by Toyota after the Relevant Period have not been and/or will not continue to be effective in remedying (or alternatively, that it has not been established that these countermeasures have been and will continue to be effective in remedying):

(a) the Vehicle Defects and Vehicle Defect Consequences to which "D" or "C" was allocated in Annexure F of the Referee's Report;

(b) the design defect described in Section B above and the Vehicle Defects and Vehicle Defect Consequences suffered wholly or partly by reason of that defect; or

(c) the increase in fuel consumption and/or decrease in fuel economy found to exist in answer to Supplementary Question 3.

D2 Applicants' submissions in support (Question 4(a))

D2.1 Definition of the 2020 Countermeasures

32 The countermeasures implemented by Toyota after the Relevant Period (**2020**

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[37] TJL.020.002.0037 at Sheet 9, cell Q25 (simple average of column Q).

[38] TJL.020.002.0037 at Sheet 9, cell Q27 and at Sheet 8, rows 48 and 49.

[39] TJL.020.002.0037 at Sheet 9, cell Q28 and at Sheet 8, rows 50 and 51.

[40] TJL.020.002.0037 at Sheet 8, row 55; see paragraphs 6 to 8 in Annexure A below.

[41] See for example: TJL.020.002.0037 at Sheet 1, row 46 and at sheet 2, row 18 ('*Trial Calculations 5*') (**Sheet 2**).

[42] See for example: TJL.020.002.0037 at sheet 3, row 19 ('*Trial Calculations 2*') (**Sheet 3**); Sheet 5, row 46; sheet 6, row 18 ('*Trial Calculations*') (**Sheet 6**).

[43] See for example: TJL.020.002.0036 at sheet 1, row 47 (proper name: '*Study of Worst Fuel Consumption Deterioration Values_Cover Page 3*'; shorthand: '*Cover Sheet*').

Countermeasures) comprise: (a) installation of a Euro 6 DOC unit in the DPF Assembly; (b) installation of a modified Additional Injector Assembly; and (c) programming changes to the ECM, which removed the cooling pulse previously used with the Additional Injector and added a "soot blow" prior to Active Regeneration.[44]

33 The 2020 Countermeasures do not include:

(a) the countermeasures implemented by Toyota between 2016 and 2019[45] which the Referee determined, and Toyota has already accepted (by its adoption of the Referee's Report), were ineffective and caused the DPF System to malfunction in Relevant Vehicles which had not previously suffered from any defect consequences;[46] or

(b) the *"level-ups"* developed and tested by Toyota during 2020 to seek to overcome the ineffectiveness of the 2020 Countermeasures (**Level Ups**) comprising: (i) a "*burn-up*" system which aims to reverse the effects of hydrocarbon coking in the DOC; and (ii) modifications to the HC limit which aim to supress white smoke production.[47]

34 The matters described in sections D2.2 to D2.4 below demonstrate that significant doubt remains as to the ongoing, real-world efficacy of the 2020 Countermeasures across the class of Relevant Vehicles, irrespective of whether they were *designed* to be effective. This is unsurprising as it is inherently unlikely that the 2020 Countermeasures could be fully effective given the design defect and inherently fraught nature of Active Regeneration described in Section B2 above. In those circumstances, the efficacy of the 2020 Countermeasures has not been established and the Applicants submit that caution should be exercised before finding otherwise, having regard to Toyota's history of implementing countermeasures which proved ineffective in the real world over time.[48]

D2.2 Toyota documents cast doubt on efficacy of the 2020 Countermeasures

35 Internal Toyota documents not only cast doubt over the ongoing, real-world efficacy of the 2020 Countermeasures, but in fact suggest that DOC clogging and the emission of white smoke persist in Relevant Vehicles in which the 2020 Countermeasures have been applied.[49] Among other things, these documents, dated mid-2020, describe: (a) vehicles in which the 2020 Countermeasures (and in some cases the Level Ups described in section D2.3 below) have been implemented experiencing increasing rates of DOC blockage approximately 6,000 kms after implementation of the countermeasures and 30% DOC clogging ratios approximately 8,800 kms after implementation; (b) white smoke and DOC clogging being "*remaining issues*"; and (c) white smoke and/or visible DOC clogging being present in 3 of 5 post-countermeasure

[44] Referee's Report [50]; Respondent's Defence, [47(i) and (j)].

[45] Respondent's Defence, [47(f) and (g)].

[46] Referee's Report [11] and [46].

[47] TCO.001.001.5349 (email chain dated between 14 January and 7 February 2020) (see discussion on pages .5349 to .5349_0002); TAL.100.132.0073 (dated 27 March 2020); TAL.100.132.0092 (dated 4 June 2020); TAL.100.152.0007 (dated 5 June 2020); TAL.100.152.0008 (dated 9 June 2020); TAL.100.132.0097 (dated 9 June 2020); TAL.100.132.0104 (dated 3 July 2020). An additional Level Up, comprising further modifications to the fuel threshold aimed at suppressing white smoke production appears to have been halted in around March 2020: TCO.005.001.2630 at sheet "Sheet 1" cell B37.

[48] Referee's Report at [11].

[49] TAL.100.142.0025 (dated 29 June 2020) (see increasing rate of "*DOC Blockage vs Test Distance*" shown by 6,000 km on pages .0025 and .0026, and 21% DOC clogging ratio at approximately 7,800km and 30% ratio at approximately 8,800km shown on page .0028); TAL.100.154.0150 (dated 8 April 2020) at .0153 (see white smoke and/or visible DOC clogging in 3 of 5 vehicles for which data was recovered); TAL.100.132.0104 (dated 3 July 2020) (see white smoke and/or visible DOC clogging in 3 of 5 vehicles for which data was recovered); TCO.005.005.0900 (dated 20 February 2020) (see references to two remaining issues – "*puff white smoke*" and "*some clogging on DOC*" at page _0004); TCO.001.001.5349 (email chain dated between 14 January and 7 February 2020) (see references to two remaining issues – "*DOC outer perimeter clogging*" and "*addition slip-through white smoke*", on pages .5349 to .5349_0002); TJL.002.001.0594 (Minutes of the Regular Monthly Engine Quality Meeting for August dated 29 August 2019) (see discussion recorded on page 3).

vehicles on which testing was conducted and for which data was recovered.

D2.3 Level Ups required to address issues remaining after 2020 Countermeasures

36 Doubts as to the efficacy of the 2020 Countermeasures are further strengthened by the fact that Toyota has considered it necessary to introduce the Level Ups to address issues remaining after implementation of the 2020 Countermeasures. Simply put, if the 2020 Countermeasures were themselves effective, there would be no need for the Level Ups. This is corroborated by internal Toyota documents concerning the Level Ups.[50]

37 Further, internal Toyota documents demonstrate that: (a) as noted in paragraph 35 above, vehicles in which the 2020 Countermeasures and Level Ups have been implemented tested by Toyota have continued to experience DOC clogging and white smoke emission;[51] (b) the Level Ups themselves have side effects, including extending Regeneration time (which, for the reasons outlined in Section C above will necessarily increase fuel consumption in the Relevant Vehicles);[52] and (c) the Level Ups have themselves already been required to be redesigned and recalibrated to improve their efficacy at least once.[53]

D2.4 Toyota's February 2021 Defence pleads that it continues to investigate DOC Build-up

38 Finally, the Respondent's Defence, filed in February 2021, itself casts doubt over the efficacy of the 2020 Countermeasures. The Respondent pleads that "*TMCA is continuing to investigate the DOC Build-up in some DPF Vehicles and is in the process of validating and implementing further enhancements.*"[54] Taken at face value and in the context of the internal documents referred to above, this strongly suggests that the Respondent itself is not satisfied about the ongoing, real-world efficacy of the 2020 Countermeasures.

D3 Applicants' submissions in support (Question 4(b))

39 The 2020 Countermeasures are designed to remedy parts of the DPF System; they are not designed to remedy (and are not capable of remedying) the Relevant Vehicles' principal reliance upon Active Regeneration to regenerate the DPF, being the design choice which the Applicants contend is defective. For the reasons described in paragraphs 32 to 38 above, the Referee could not be satisfied that the 2020 Countermeasures have been and will continue to be effective in remedying the Vehicle Defects and Vehicle Defect Consequences to which the design defect contributes.

D4 Applicants' submissions in support (Question 4(c))

40 There is no evidence to suggest that the 2020 Countermeasures were designed to address (or are capable of addressing) the increased fuel consumption which results from the Vehicle Defects and/or Vehicle Defect Consequences as described in Section C2 above or have been and will continue to be effective in do so. Instead, for the reasons described in Sections C2 and D2 above, the Applicants submit that it has not been established (and should not be inferred) that the 2020 Countermeasures are (or will continue to be) effective to remedy the increased fuel consumption described in Section C2 above. In fact, as described in paragraph 37 above, one of the side effects of the Level Ups is to prolong the duration of Regenerations and thereby necessarily increase fuel consumption in the Relevant Vehicles.

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[50] See for example: the "*Carbon Coking Test*" graph in TAL.100.152.0007 and in TAL.100.132.0092 at .0093.

[51] TAL.100.142.0025 (dated 29 June 2020) (see increasing rate of "*DOC Blockage vs Test Distance*" shown by 6,000 km on pages .0025 and .0026, and 21% DOC clogging ratio at approximately 7,800km and 30% ratio at approximately 8,800km shown on page .0028).

[52] See for example, TAL.100.132.0073 at .0081 (see also page .0079).

[53] TAL.100.152.0007; TAL.100.132.0092; TAL.100.132.0097 at .0102; TAL.100.144.0192.

[54] Respondent's Defence [47(k)].

ANNEXURE A

16 September 2019 analysis and calculations

1 The first step in Toyota's 16 September 2019 analysis was to calculate the "*Regeneration Frequency*" (%) shown in column J of Sheet 9, being the distance that the Toyota Study Vehicles travelled while undergoing Regeneration as a proportion of the total distance travelled. As described in paragraph 22 above, the average Regeneration Frequency across the Toyota Study Vehicles was 16.4%,[55] compared to the figures of between approximately 5.4% and 6.5% presented in the certification materials for the Relevant Vehicles.[56]

2 The second step was to calculate the "*NEDC Mode Fuel Consumption*" rate (in L/100kms) shown in column K of Sheet 9 by reference to the proportion of the total distance travelled by the Toyota Study Vehicles during which they were regenerating (versus not regenerating) and the vehicles' relative fuel consumption rates when regenerating (versus not regenerating), taken from the certification materials for the Relevant Vehicles, according to the following formula:

$$\frac{(RD \times FC\ when\ Regenerating) + (NRD \times FC\ when\ not\ Regenerating)}{Distance\ Travelled} = Fuel\ Consumption\ for\ Test\ Vehicle^{57}$$

Where:

RD =	*Regeneration Distance*[58]
NRD =	*No-Regeneration Distance*[59]
FC when regenerating =	*12.24 L/100km*[60]
FC when not regenerating =	*7.92 L/100km*[61]

3 The third step was to use this "*NEDC Mode Fuel Consumption*" rate to calculate the "*Fuel Consumption Deterioration (compared to normal vehicle)*" (%) shown in column L of Sheet 9 (**Fuel Consumption Deterioration Percentage**) according to the following formula:

$$\left[\left[\frac{Fuel\ Consumption\ for\ Test\ Vehicle^{62}}{8.05}\right] - 1\right] \times 100 = Fuel\ Consumption\ Deterioration^{63}$$

[55] TJL.020.002.0037 at Sheet 9, column J (simple average of row 4 to 24).

[56] TCO.999.003.0006: Calculated by reference to the number of operating cycles required for Regeneration as a proportion of the sum of the number of operating cycles between Regeneration events and the number of operating cycles required for Regeneration.

[57] TJL.020.002.0037 at Sheet 9, column K. The formulae underlying the figures in column K appear to have inadvertently been deleted from the NAATI certified translation of the spreadsheet but appear in the original Japanese version here).

[58] TJL.020.002.0037 at Sheet 9, column E.

[59] TJL.020.002.0037 at Sheet 9, column F.

[60] This is obtained by converting 10.08 L/100km (the rate of fuel consumption during Active Regeneration obtained from Toyota's certification material for the Relevant Vehicles) to the corresponding amount for 1 cycle in NEDC Mode. See TCO.999.003.0006 at .0006 and TJL.020.002.0037 at sheet 10, cell C5 ('*Summary*') (**Sheet 10**).

[61] This being the weighted average fuel consumption for the Relevant Vehicles (including during and between periods of Regeneration) stated in the certification materials for the Relevant Vehicles (see TCO.999.003.0006 at .0006 – noting that the Applicants consider it would have been more logical to use the fuel consumption rate of 7.78L/100km for the vehicles when not regenerating stated in the certification material – and TJL.020.002.0037 at Sheet 10, cell C3).

[62] TJL.020.002.0037 at Sheet 9, column K.

[63] TJL.020.002.0037 at Sheet 9, column L. The formulae underlying the figures in column K appear to have inadvertently been deleted from the NAATI certified translation of the spreadsheet but appear in the original Japanese version here.

Where 8.05L/100km is the rate of fuel consumption calculated by Toyota for a 'normal vehicle' using the formula described in paragraph 2 of Annexure A above and the values set out in sheet 10 of TJL.020.002.0037, row 11, columns D to I.[64]*:*

4 The average of the Fuel Consumption Deterioration Percentages for the Toyota Study Vehicles shown in Column L of Sheet 9 is 5.2% (**Average Fuel Consumption Deterioration Percentage**).

5 Toyota's analysis involved the application of further steps:

(a) first, to seek to exclude the asserted influence of "short trips" on fuel consumption deterioration, negative values created by the exclusion of the asserted "short trip influence" and values where the fuel consumption deterioration (after the exclusion of the asserted "short trip influence") was less than 5%,[65] which resulted in the calculation of an alternative average Fuel Consumption Deterioration Percentage of 8.8%;[66]

(b) second, to add three standard deviations to the alternative average Fuel Consumption Deterioration Percentage of 8.8% referred to in subparagraph (a) above to calculate the "*Worst rate of fuel consumption deterioration at the point in time when customers became aware of white smoke*" of 17%[67] (**Worst-case Fuel Consumption Deterioration Rate)**; and

(c) the Worst-case Fuel Consumption Deterioration Rate of 17% was divided by 2 in order to obtain a "*usage process average*", described as the "*average rate of fuel consumption deterioration up until the point in time when customers became aware of white smoke*" of 8.5%.[68]

19 September 2019 and 20 September 2019 analysis and calculations

6 As noted in paragraph 28(g) above, the 16 September 2019 analysis and calculations appear to have been reported to a "Head of Department" within Toyota who in turn requested that an alternative methodology be applied to try to calculate the fuel consumption deterioration suffered by Relevant Vehicles experiencing excess active regeneration as a result of the defects (**Alternative Methodologies**).[69]

7 The precise reasoning and source data used in the application of these Alternative Methodologies are not clear to the Applicants from the Study Spreadsheets, however each is described as attempting to calculate the fuel consumption deterioration owing to the occurrence of extended regeneration time[70] and appears to have involved:

(a) assuming a fuel consumption deterioration of either 20.5% or 36.4% in a vehicle which is in a constant state of Active Regeneration (depending on the assumed proportions of use: 20.5% = 5% idle, 25% city, 40% country, and 30% highway; 36.4% = 20% idle, 50% city, 20% country, and 10% highway);[71]

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[64] TJL.020.002.0037 at Sheet 10, cell C11.

[65] TJL.020.002.0037 at Sheet 9, rows M to P.

[66] TJL.020.002.0037 at Sheet 9, cell Q25 (simple average of column Q).

[67] TJL.020.002.0037 at Sheet 9, cell Q27 and at Sheet 8, rows 48 and 49.

[68] TJL.020.002.0037 at Sheet 9, cell Q28 and at Sheet 8, rows 50 and 51.

[69] TJL.020.002.0037 at Sheet 8, rows 55 to 71.

[70] See for example: TJL.020.002.0038 at sheet 1, row 9 (sheet 1 proper name: *'Study of Worst Fuel Consumption Deterioration Values_Cover Page 6'*; shorthand: *'Cover Sheet 6'*); sheet 5, row 9 (sheet 5 proper name: *'Study of Worst Fuel Consumption Deterioration Values_Cover Page 2'*; shorthand: *'Cover Sheet 2'*). See also equivalent sheets in TJL.020.002.0037.

[71] TJL.020.002.0037 at Sheet 1, cell J45; Sheet 2, cell F 17; Sheet 3, cell F18; Sheet 5, cell J45.

(b) using various methods to calculate a "*regeneration rate*" (ie a percentage of the time vehicles manifesting the defects were regenerating);[72] and

(c) multiplying this regeneration rate by either 20.5% or 36.4% to determine the fuel consumption deterioration experienced by those vehicles.[73]

8 Using these Alternative Methodologies, Toyota calculated estimated fuel consumption increases in vehicles in which white smoke has been noticed of 13.7%,[74] 11.4%[75] and 8.3%.[76]

[72] See for example: TJL.020.002.0037 at Sheet 2, rows 18 to 77; Sheet 3, rows 19 to 76; Sheet 6, rows 18 to 76.

[73] See for example: TJL.020.002.0037 at Sheet 2, rows 18 to 77; Sheet 3, rows 19 to 76; Sheet 6, rows 18 to 76.

[74] See for example: TJL.020.002.0037 at Sheet 1, row 46; Sheet 2, row 18; TJL.020.001.0018 at sheet 1, row 46 (proper name: *'Study of Worst Fuel Consumption Deterioration Values_Cover Page 2'*; shorthand: *'Cover Page 2'*); sheet 2, row 18 (*'Trial Calculations'*).

[75] See for example: TJL.020.002.0037 at Sheet 3, row 19; Sheet 5, row 46; Sheet 6, row 18.

[76] See for example: TJL.020.002.0036 at sheet 1, row 47 (proper name: *'Study of Worst Fuel Consumption Deterioration Values_Cover Page'*; shorthand: *'Cover Sheet'*).

FEDERAL COURT OF AUSTRALIA **NSD 1210 OF 2019**
DISTRICT REGISTRY: NSW
DIVISION: GENERAL

Kenneth John Williams
Applicant

Toyota Motor Corporation
Australia Limited
Respondent

SUPPLEMENTARY REFERENCE

RESPONDENT'S STATEMENT OF CONTENDED FINDINGS

I. INTRODUCTION

1. On 19 January 2021, the Court made Orders (**January Orders**) that provided, *inter alia,* for the questions set out in Annexure E to the January Orders (**Supplementary Questions**) to be referred to Mr David Garrett (**Referee**) for the purposes of the Referee conducting an inquiry into the Supplementary Questions (**Supplementary Reference**) and to make a report in writing to the Court on the Supplementary Questions stating, with reasons, the Referee's opinion on the Supplementary Questions (**Supplementary Report**).

2. This statement of contended findings (**Statement of Findings**) is submitted pursuant to Order 6(g) of the January Orders and Rule 28.65(7) of the *Federal Court Rules 2011* (Cth).

3. Annexure E to the Referee's Report dated 15 October 2020 (**First Report**) is a Statement of Agreed Facts and Dictionary dated 15 July 2020 (**SOAF**).

4. Capitalised terms used in this Statement of Findings have the meanings given to them in the SOAF.

5. References to "Toyota" in this Statement of Findings are references to Toyota entities other than the respondent.

6. The respondent proposes that the Referee adopt the findings of fact set out in this Statement of Findings in the Supplementary Report for the reasons set out in the submissions attached at Annexure A, submitted pursuant to Order 6(g) of the January Orders (**Submissions in Chief**).

II. RESPONSE TO SUPPLEMENTARY QUESTIONS 1 & 2

7. **Supplementary Question 1** asks:

> *Are the Relevant Vehicles defective by reason of the fact that they are designed to rely principally on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF?*

8. The respondent proposes that the Referee's answer to Supplementary Question 1 is "no" and, further, that the Referee adopt the following findings of fact:

   (a) A DPF system that is designed to rely principally on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration:

      (i) had been deployed by Toyota in predecessor models and variants manufactured for and distributed in other world markets;

      (ii) is conventional in light duty diesel vehicles and widely used in the industry by other manufacturers; and

      (iii) does not, by reason of the fact that it is designed to rely principally on Automatic Regeneration and / or Manual Regeneration, *per se*, rather than Passive Regeneration render the Relevant Vehicles defective.

9. **Supplementary Question 2** asks:

> *If Supplementary Question 1 is answered "yes", do the Relevant Vehicles suffer, or have they during the Relevant Period suffered, any of the Vehicle Defects and / or Vehicle Defect Consequences wholly or partly by reason of that defect?*

10. In light of the respondent's proposed answer to Supplementary Question 1, the Referee is not required to answer Supplementary Question 2.

III. RESPONSE TO SUPPLEMENTARY QUESTION 3

11. **Supplementary Question 3** asks:

> *Is the fuel consumption of the Relevant Vehicles increased and / or their fuel economy decreased by reason of:*
>
> *a. the Vehicle Defects and / or Vehicle Defect Consequences to which a "D" or "C" was allocated under Annexure F of the Referee's Report and, if so, by how much; and / or*
>
> *b. if Supplementary Question 1 is answered "yes", the Relevant Vehicles' reliance on Automatic Regeneration and Manual Regeneration, rather than Passive Regeneration, to regenerate the DPF and, if so, by how much?*

12. The respondent proposes that the Referee's answer to Supplementary Question 3 is "no" and that the Referee adopt the following findings of fact:

(a) It is impossible to conclude that the "core defect" (and consequently, the Vehicle Defects and Vehicle Defect Consequences) had any discernible impact on fuel economy. The Referee has already reached this conclusion.[1] There is no basis to depart from this prior conclusion.

(b) An increase in the frequency of automatic regeneration did not have any discernible impact on long term fuel economy. The Referee has already reached this conclusion.[2] There is no basis to depart from this prior conclusion.

(c) Fuel consumption on public roads varies significantly depending on an array of differently interplaying factors that are unique to each individual vehicle and its particular driving history, as the Referee has already concluded.[3] In addition, a large number of Relevant Vehicles have not suffered any Vehicle Defect Consequences (see paragraph 42 in the Submissions in Chief). Those that have will have experienced them in varying degrees and for different periods of time. Further, the countermeasures remedying the core defect (see section III of Submissions in Chief) have been applied to different vehicles at different points in time. For these reasons, it is not possible to quantify any additional fuel consumption, even if it was material or discernible (which it is not) on any basis other than an examination of each individual vehicle and its individual driving history including the array of factors referred to above. It cannot be assessed on any kind of generalised or aggregate basis. For present purposes, it is impossible to calculate a theoretical figure for reduced fuel economy and extrapolate that to all of the Relevant Vehicles. Nor is it possible to identify a representative vehicle and conduct testing on that vehicle and then extrapolate the test results to apply to all Relevant Vehicles.

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[1] First Report [19]. We understand that the references in the First Report to "*fuel efficiency*" are equivalent to "*fuel economy*".
[2] First Report [70]
[3] First Report [69]. As noted, these factors include, but are not limited to, *"ambient temperature, barometric pressure, and humidity; driving style; road surface and grade; tire inflation pressure, tire size and construction vehicle loading (passengers, cargo); and vehicle accessories which negatively affect aerodynamic (such as roof-mounted carrier or cargo box)."* To these may be added specific vehicle model, engine (1GD or 2GD) and transmission type (manual or automatic).

IV. RESPONSE TO SUPPLEMENTARY QUESTION 4

13. **Supplementary Question 4** asks:

To what extent (if at all) is it established that the countermeasures implemented after the Relevant Period, have been and will continue to be effective in remedying:

a. the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated under Annexure F of the Referee's Report;

b. in the event that Supplementary Question 1 is answered "yes", that defect and any Vehicle Defects and Vehicle Defect Consequences suffered wholly or partly by reason of that defect; and / or

c. any increase in fuel consumption and / or decrease in fuel economy found to exist in answer to Supplementary Question 3 above?

14. The respondent proposes that the Referee's answer to Supplementary Question 4 is:

(a) The countermeasures implemented by the respondent after the Relevant Period, being the 2020 Field Fix[4] and the 2018 Production Change[5] (the **2020 countermeasures**[6]), have been effective in remedying the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the First Report.

(b) In light of the respondent's proposed answer to Supplementary Question 1, the Referee is not required to answer Supplementary Question 4(b).

(c) Given the proposed answers to Supplementary Questions 1, 3, 4(a) and 4(b), there is no evidence that the 2020 countermeasures were required to address fuel consumption or fuel economy in the Relevant Vehicles.

15. Further, the respondent contends that the Referee adopt the following findings of fact:

(a) When a vehicle presents to a Dealer[7] with a Vehicle Defect and/or a Vehicle Defect Consequence, the issue is capable of being resolved by applying the 2020 Field Fix.

(b) Only **8.3%** of the total number of Relevant Vehicles have thus far had the 2020 Field Fix applied in circumstances where the balance of Relevant Vehicles continue to be effective for consumer use.[8]

(c) Only **1.32%** of the number of Relevant Vehicles that have had the 2020 Field Fix applied have then had any further DPF-related reimbursement claim made by

[4] As defined in paragraph 47(i) of the Defence to the Further Amended Statement of Claim (**Defence**).
[5] As defined in paragraph 47(f)(i)(B) of the Defence.
[6] The respondent has not referred to the 2020 Production Change in the Statement of Contented Findings and Submissions as vehicles which have been manufactured with the 2020 Production Change are not Relevant Vehicles.
[7] Dealers operate as franchises that are separate corporate entities to the respondent: Defence [5].
[8] TAL.100.157.0130

Dealers.[9] Further, only up to **0.11%** of the total number of Relevant Vehicles have been subject to any further DPF-related reimbursement claim made by Dealers following the implementation of the 2020 Field Fix.[10] These low incidence rates are also the result of a number of unrelated and immaterial causes.

The respondent's Statement of Contended Findings was prepared and settled by Clayton Utz, solicitors for the respondent and A E Munro and X Teo of Counsel.

[9] TAL.100.157.0130
[10] TAL.100.157.0130

ANNEXURE A

RESPONDENT'S SUBMISSIONS IN CHIEF

I. SUPPLEMENTARY QUESTIONS 1 AND 2 - DESIGN DEFECT

Introduction

1. Passive Regeneration is Regeneration that occurs in the course of operating the vehicle without intervention by the driver or the ECM.[11]

2. Passive Regeneration occurs when the exhaust gas temperature is above 500°C.[12]

3. Automatic Regeneration is initiated when the ECM calculates that the accumulated particulate matter in the DPF has reached the predetermined PM Base Level,[13] and is not based on distance travelled since the last regeneration.[14]

4. The Relevant Vehicles were not designed to rely upon Passive Regeneration to remove particulate matter from the DPF. Regeneration of the DPF in the Relevant Vehicles is principally achieved through Automatic Regeneration and, where a DPF Switch is fitted, may be achieved through Manual Regeneration.[15]

5. The Referee has been asked to determine whether *the Relevant Vehicles are defective by reason of the fact that they are* ***designed to rely principally*** *on Automatic Regeneration and, where a DPF Switch is fitted, on Manual Regeneration,* ***rather than*** *Passive Regeneration, to regenerate the DPF* (emphasis added).

6. For the reasons set out below, the respondent contends that the answer to Supplementary Question 1 is "no". It follows that the Referee is not required to answer Supplementary Question 2.

Emissions regulations

7. Throughout the Relevant Period, the minimum emissions standard for new light diesel vehicles in Australia was regulated by:

   (a) ADR 79/03 for vehicles manufactured on or after 1 November 2013 but before 1 November 2016; and

   (b) ADR 79/04 for vehicles manufactured on or after 1 November 2016.[16]

[11] SOAF - Schedule 1 - Dictionary
[12] First Report, footnote 47
[13] SOAF [21]; First Report [73]
[14] First Report [73]; Annexure F
[15] First Report, Annexure F
[16] SOAF [3]

8. As the Referee will be aware, ADR 79/03 and ADR 79/04 adopt the United Nations Regulation UN-R83 Revision 4, known as "**Euro 5**",[17] for the Relevant Vehicles as summarised in the table at TAL.100.161.0001.[18]

9. ADR 79/03 and ADR 79/04 are performance standards, which define the maximum level of exhaust emissions permitted under the Type I test specified by Annex 4a of ADR 79/03 and Annex 4a of ADR 79/04, respectively.[19]

10. During the Relevant Period, ADR 79/03 and ADR 79/04 imposed standards limiting the level of NO_X that the Relevant Vehicles were allowed to emit.[20]

11. During the Relevant Period, to comply with emission limits in ADR 79/03 and ADR 79/04 in respect of Pollutant Emissions, the Relevant Vehicles were fitted with the DPF System.[21]

12. The systems necessary to ensure compliance with the emission limits imposed by ADR 79/03 and ADR 79/04 have the effect of reducing the PM Ratio to a level which is generally insufficient to consistently trigger Passive Regeneration. The obligation to comply with Euro 5[22] has seen original equipment manufacturers (**OEM**) of light diesel vehicles, including Toyota, elect to deploy after-exhaust systems that rely primarily on Automatic Regeneration rather than Passive Regeneration.[23]

13. For Toyota, this approach has also been taken in a series of predecessor models and variants manufactured for and distributed in other world markets.[24]

14. In this regard, the respondent understands that the models and variants detailed in TJL.999.002.1000, which adopt a DPF system that includes a DOC and is designed to rely principally upon Automatic Regeneration, also utilise the following common design elements:

(a) a fifth injector;

(b) Cordierite or SiC in the DPF substrate material; and

(c) an under-floor or close-coupled DPF layout,

which, unlike the Relevant Vehicles, have not been reported as suffering the Vehicle Defects or the Vehicle Defect Consequences alleged in these proceedings, despite those elements being common throughout both the Relevant Vehicles and vehicles that are not the subject of these proceedings.

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[17] SOAF [4]
[18] Source: https://www.infrastructure.gov.au/vehicles/environment/emission/files
[19] SOAF [5]
[20] SOAF [6]
[21] SOAF [7]
[22] TAL.100.161.0001
[23] See, for example, TJL.999.002.0007_EN, TJL.999.002.0009_EN, TJL.999.002.0001_EN, TJL.999.002.0016_EN, TJL.999.002.0030_EN, TJL.999.002.0015_EN, TJL.999.002.0011_EN
[24] TJL.999.002.1000

Use of Automatic Regeneration did not cause the Vehicle Defects or the Vehicle Defect Consequences

15. Having regard to the findings that the Referee has already made,[25] which have been adopted by the Court, the Referee did not find, and the respondent contends he could not have found, that the use of Automatic Regeneration and / or Manual Regeneration, *per se* caused the Vehicle Defects or the Vehicle Defect Consequences.[26]

16. This is supported by the fact that the 2020 countermeasures were designed to address the DPF Issues by deploying the following:

    (a) reflash the ECM;

    (b) replace the DPF Assembly (which includes the DOC); and

    (c) replace the Additional Injector housing assembly.[27]

17. As the Referee recognised in the First Report, the 2020 countermeasures "appear to remedy the defects in the DPF System".[28] The respondent submits that this conclusion is reinforced by the submissions in response to Supplementary Question 4 below.[29]

18. Further, there is no evidence to support the applicant's allegation that continuing to principally rely upon Automatic Regeneration and / or Manual Regeneration, *per se*, rather than Passive Regeneration caused, or causes, the Relevant Vehicles to be defective.

II. SUPPLEMENTARY QUESTION 3 - FUEL CONSUMPTION

19. The respondent's contended findings reflect the conclusions that the Referee reached in his First Report. Those conclusions are sound and there is no basis for departing from them. The applicants have not provided any additional documents to the Referee since the First Report. On 12 March 2021, the respondent provided the Referee with 32 documents that relate (in some way) to fuel consumption.[30] Two of these documents are an estimate of the worst case of additional fuel consumption for a vehicle that blows white smoke due to a clogged DOC.[31] These two documents are in Japanese. A translation created by the applicants has been provided to the Referee. TJL.020.002.0031_EN is a condensed version of TJL.020.002.0037_EN. This submission will address TJL.020.002.0037_EN as it is the more comprehensive document.

20. The worksheet in TJL.020.002.0037_EN titled *Cover Sheet 5* states that this document is the "Estimate of <u>worst</u> rate of fuel consumption deterioration" [underlining added]. Its stated

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[25] First Report [34], [38], [39]
[26] First Report, Annexure F, 39(a) and 39(b)
[27] First Report [50]
[28] First Report [12]
[29] Annexure A, section III, including paragraph 50
[30] These are the documents in categories 2(b)(i) to (iii) of the *"Index—Documents identified by the respondent as responsive to the Supplementary Reference Categories*" (**Index of Documents**).
[31] These two documents are TJL.020.002.0031_EN and TJL.020.002.0037_EN, which are items 20 and 21 in the Index of Documents. The remaining 30 documents are in category 2(b)(ii). Among other things, these 30 documents contain variants and excerpts of TJL.020.002.0037_EN.

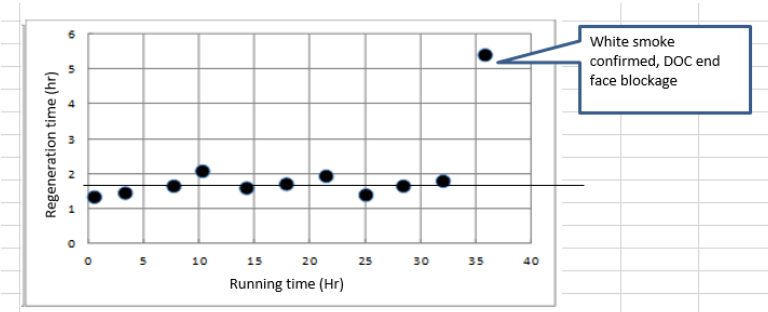
purpose is to "estimate the <u>worst value</u> for fuel consumption deterioration that could be experienced by customers who have experienced white smoke (DOC end face clogging)" [underlining added].[32] Consistent with these statements, this submission will refer to TJL.020.002.0037_EN as the **Worst Case Estimation**.

21. The Worst Case Estimation consists of two types of estimate: one based on a single vehicle and one based on data derived from 11 vehicles. The single vehicle analysis and 11 vehicle analysis are addressed in turn below. In summary, both estimates are preliminary and unreliable and do not, nor were they ever intended to, provide a sound basis for any formal or final conclusions. Taken at face value, they are highly hypothetical and do no more than speculate on theoretical and conjectural worst case scenarios.

The single vehicle analysis

22. The results of the single vehicle analysis are detailed in the worksheets titled *Cover Sheet 5, Trial Calculations 5, Trial Calculations 2, Cover Sheet 2* and *Trial Calculations* of the Worst Case Estimation. These worksheets estimate a 13.7% decrease in fuel economy at the time a customer notices a vehicle blowing white smoke for one set of driving conditions and a 11.4% decrease for another set of driving conditions.[33] Both are unreliable for the same reasons. To avoid repetition these submissions will only refer to *Cover Sheet 5* and *Trial Calculations 5*. The flaws with the single vehicle analysis in *Cover Sheet 5* and *Trial Calculations 5* are as follows.

23. **Firstly**, the conclusions in *Cover Sheet 5* and *Trial Calculations 5* are based on an unreliable, single source, being a dot graph found in *Trial Calculations 5* which is shown to the right (the **Dot Graph**).



24. The Dot Graph is a series of regeneration times for a single prototype DPF in an endurance test vehicle in the development stage that became clogged due to a software deployment error, which was later fixed. The Dot Graph was for a test conducted on a 2GD Hilux in 2013 on roads in Melbourne but the transmission type and nature of the test is unknown. It is critical to note that a vehicle dating from 2013 is not a "Relevant Vehicle" for this proceeding. Hence,

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[32] This purpose is referred to as an "output" in the document (see rows 3 and 4) but it is clear from the context that this is its purpose.
[33] For 13.7%, the conditions are 20% idling, 50% city driving, 20% of country driving and 10% highway driving: see *Cover Sheet 5 and Trial Calculations 5.* For 11.4%, the conditions are 5% idling, 25% city driving, 40% of country driving and 30% highway driving: see *Trial Calculations 2, Cover Sheet 2* and *Trial Calculations.*

the single vehicle analysis is not even for a vehicle that is the subject of this proceeding. Further, the DPF system in this vehicle was a prototype that was under development rather than a final version that was mass produced. This is evident from the Worst Case Estimation.[34]

25. Some information about the Dot Graph can be drawn from TCO.999.003.0025_EN, which is dated 26 June 2014.[35] That document states (i) the Dot Graph is data from "an endurance testing car in Australia" where there "was a software deployment error" [underlining added] and (ii) "[i]n the evaluation with the latest constraints & latest hardware, no clogging occurred even if the regeneration acceleration test was performed in the same way". It is evident that this test was conducted by 26 June 2014 (the date of the document) at the latest, but was in fact conducted in 2013, which is before any of the Relevant Vehicles were allegedly manufactured.[36] The Dot Graph cannot be relied on when it dates from at least two years prior to the manufacture of the Relevant Vehicles; it was a test conducted on a faulty piece of equipment which was later replaced and found to have no issues; it was a test on a prototype conducted at the development stage; and is an account of a single test on one vehicle in unknown road conditions which cannot sensibly be taken as representative of the performance of the 250,000-plus Relevant Vehicles.

26. **Secondly**, the subsequent statistical analysis of the Dot Graph in the Worst Case Estimation is deficient. The figure of 13.7% in *Cover Sheet 5* is derived from "Proposal 2" in the worksheet titled *Trial Calculations 5*. Proposal 2 was adopted after Proposal 1 was rejected on the basis that the value it generated (3.5%) was "too small". The document contains no explanation for rejecting Proposal 1 apart from it being "too small". In addition to the rejection of Proposal 1, there is a primary error with the method used in Proposal 2.[37]

27. The primary error is the application of three standard deviations to the data point of 5.6 hours in the Dot Graph, which appears to represent the regeneration time when white smoke appears. Proposal 2 in *Trial Calculations 5* calculates the mean and standard deviation of nine of the data points in the Dot Graph. These nine points range from approximately 1.4 to 2.2 hours. The mean of these nine data points is 1.64 and the standard deviation is 0.31. *Trial Calculations 5* then calculates three standard deviations (being 0.93) as a percentage of the mean (being 1.64), giving 56.68%. Proposal 2 then inflates the highest value in the Dot Graph, which is 5.6 hours, by that percentage to give 8.77 hours. This is an intentional, but necessarily artificial, construct used to hypothetically inflate a figure in order to derive a worst possible theoretical case. 8.77 hours does not represent any of the data points in the Dot Graph. It is highly pessimistic conjecture. The lengths that are taken to create an inflated

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[34] See *Trial Calculations 5* at cell H38, *Trial Calculations 2* at cell H39 and *Trial Calculations* at cell I38.
[35] Item 23 in the Index of Documents. The Dot Graph is also identified as "old hardware & old software conditions": see TCO.999.003.0001_EN; item 40 in the Index of Documents.
[36] See item A in the Overview of Claim in the Further Amended Statement of Claim dated 20 January 2021, which says, "Starting in October 2015 and continuing to the present day, the Respondent… has manufactured and sol d around 250,000 vehicles in Australia that are defective".
[37] This error is not an exhaustive list of the errors with Proposal 2 in *Trial Calculations 5*.

regeneration time can be seen in another version of the Worst Case Estimation (TCO.999.003.0017). In the worksheet titled *Estimate (3),* four standard deviations are used instead of 3 and even then the document says "There is the possibility [sic] this is underestimated. Re-evaluate" (see rows 82 and 90).

28. **Thirdly**, the single vehicle analysis relies on measurements for fuel consumption contained in the table in *Cover Sheet 5* and assumed driving conditions where a certain amount of time is spent idling, driving in city conditions and the like. The fuel consumption in that table is for a 2GD engine. Not all Relevant Vehicles have a 2GD engine. Further, the driving conditions may not match the conditions under which any of the Relevant Vehicles were driven.

The 11 vehicle analysis

29. The worksheet titled *Cover Sheet* states the "[w]orst rate of fuel consumption deterioration at the point in time when customers became aware of white smoke" is 17%. This figure is based on data extracted from the ECUs of 11 vehicles where the customer claimed there to be issues with the DPF.[38] The 11 vehicles are listed in the worksheet, *Appendix 1*.[39] Fundamentally, it is unreliable because it is no more than a desk-top analysis of ECU data and is not based on testing. There are numerous further specific reasons why the 11 vehicle analysis is unreliable.

30. **Firstly**, *Appendix 1* does not contain any data for the <u>actual</u> fuel consumption of the 11 vehicles. Instead, it assumes the 11 vehicles all have the same fuel consumption as the "normal vehicle" in the *Summary* worksheet. This "normal vehicle" is a 2GD Hilux with automatic transmission. *Appendix 1* extrapolates each of the 11 vehicle's overall fuel consumption based on the one rate of consumption in the *Summary* worksheet and the relative distances that each of the 11 vehicles were believed to have travelled in regeneration and non-regeneration cycles. These relative distances are based on data extracted from the ECUs of each of the 11 vehicles instead of actually testing to see how far the vehicles travelled when regenerating and not regenerating. This is all evident from the formulae in cells K7 to K24 of *Appendix 1*. This approach is inherently less reliable than actually testing the fuel consumption of the 11 vehicles.

31. **Secondly**, the vehicle in the *Summary* worksheet does not correspond to any of the 11 vehicles in *Appendix 1*.[40] None of the vehicles in *Appendix 1* is a 2GD automatic Hilux.

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[38] See row 32 of *Cover Sheet* which states, "Sample data: Use data obtained based on things pointed out by customers" and row 1 of *Appendix 1* which states, "Vehicles about which customers reported white smoke".

[39] *Appendix 1* lists vehicles numbered 1 to 13 but item 12 is missing and the vehicle with VIN MR0KA3CD401197224 appears twice. Hence, there are 11 vehicles.

[40] TCO.005.002.7846_EN (item 27 in the List of Documents) identifies 6 of the vehicles in the *Appendix 1*. These are four 1GD, 6-speed auto Hiluxs (MR0HA30D400378176, MR0KA3CD401197224, MR0HA3CD300407182 and MR0HA3CD000399896); one 1GD, 6-speed auto Prado (JTEBR3FJ80K020948); and one 2GD, 5-speed manual Hilux (MR0FB3CB000221067). TCO.005.002.7846_EN also identifies two vehicles in the *Normal Vehicle* worksheet, being a 1GD, 6-speed auto Prado (JTEBR3FJ10K033069) and a 1GD, 6-speed auto Prado (TEBR3FJ30K093970). The worksheet *GTSSpecialModeData(pro-2018CSC)* in TCO.005.001.2659_EN identifies the remaining 5 vehicles in *Appendix 1.* These are one 1GD, 6-speed automatic Fortuner (MROHA3FS00040720), three 1GD, 6-speed automatic Hiluxs (MR0HA3CD900377234, MR0HA3CD700406259 and MR0KA3CD401197224), one 2GD, 5-speed manual Hilux (MR0EB3CB000443698) and one 1GD, 6-speed manual Fortuner (MR0HA3FS400029092).

32. **Thirdly**, *Appendix 1* applies the method in paragraph 30 to only a small fraction of the total distance travelled by each of the 11 vehicles. This can be seen by comparing the "Distance travelled" (column D) in *Appendix 1* to the total "mileage" (column E) of each vehicle in the *GG&PartsRecovery* worksheet in TCO.005.002.7846_EN.[41] This fraction is only a "sample".[42] This fraction may not be indicative of the vehicle's overall performance.

33. **Fourthly**, *Appendix 1* contains results which clearly indicate it is unreliable. According to *Appendix 1*, vehicles that are stated to be blowing white smoke have better fuel economy than the "normal vehicle" in the *Summary* worksheet.[43] Further, the *Normal Vehicles* worksheet adopts the same method for determining deterioration in fuel economy as *Appendix 1* then concludes that all of these "normal vehicles" have significantly worse fuel economy than the "normal vehicle" in the *Summary* worksheet. Further again, the average decline in fuel economy of the "normal vehicles" in the *Normal Vehicles* worksheet is greater than the average decline in fuel economy of the supposedly defective vehicles in *Appendix 1*.[44] These outcomes are, on their face, contradictory and absurd. This is not surprising when one considers that an inherently unreliable method has been used (as explained above).

34. **Fifthly**, the vehicle having the *"worst values for defective vehicles in the market"* according to the *Summary* worksheet (JTEBR3FJ10K033069) is listed in the *Normal Vehicles* worksheet as a *"normal vehicle"*.[45] Once again, this is contradictory and absurd.

35. **Sixthly**, *Appendix 1* starts with a small sample size of only 11 vehicles then reduces that even further to only 5 (see column Q).

36. **Seventhly**, *Appendix 1* increases its average decline in fuel economy, which is unreliable for the reasons stated above, by 3 standard deviations to get an artificially inflated figure: see row 27.

Summary and conclusion

37. For the reasons stated above, the Worst Case Estimation is unreliable and highly theoretical, but even if it were not, it is of no assistance in answering Supplementary Question 3, which is whether the fuel consumption of the Relevant Vehicles increased by reason of the Vehicle Defects or Vehicle Defect Consequences. The Worst Case Estimation only addresses a worst

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[41] A comparison of the total mileage in TCO.005.002.7846_EN and the distance considered in *Appendix 1* is as follows:

Vehicle in *Appendix 1*	1. Total mileage in TCO.005.002.7846_EN	2. Distance considered in *Appendix 1*	Percentage (2/1)
MR0HA30D400378176	90,442km	4,162km	4.60%
MR0KA3CD401197224	160,928km	16,779km	10.43%
MR0HA3CD300407182	45,527km	7,272km	15.97%
MR0HA3CD000399896	40,686km	5,831km	14.33%
JTEBR3FJ80K020948	71,814km	5,807km	8.09%

[42] See rows 66 and 67 in each of the worksheets in TCO.005.002.7846_EN other than *GG&PartsRecovery*.
[43] This can be seen in cells O7, O14, O18 and O20 of *Appendix 1* which each contain a negative number. A negative number indicates an improvement in fuel economy compared to the "normal vehicle".
[44] The average decline in fuel economy in the *Normal Vehicles* worksheet is 4.2% (see cell L17) while in *Appendix 1* it is 3.6% (see cell O25).
[45] Row 12 of the *Summary* worksheet in the Worst Case Estimation shows this vehicle as having a supposed regeneration time of 3,020 minutes. Row 16 of the *Regeneration Time Distribution* worksheet identifies this vehicle as JTEBR3FJ10K033069, which can then be found in the *Normal vehicles* worksheet.

case scenario for vehicles that are blowing white smoke. If a vehicle is not blowing white smoke, the Worst Case Estimation is irrelevant. If a vehicle did blow white smoke, there is then a question of how long this occurred over the total life of the vehicle. It is unlikely that this question can be answered for any of the 250,000 plus Relevant Vehicles, let alone all of them. Even if it can be, the Worst Case Estimation only considers two driving patterns, which may not resemble the driving pattern of any of the 250,000 plus Relevant Vehicles.

III. SUPPLEMENTARY QUESTION 4 - 2020 COUNTERMEASURES

Introduction

38. As to Supplementary Question 4(a), the respondent contends that the 2020 countermeasures have been effective in remedying the Vehicle Defects and Vehicle Defect Consequences to which a "D" or "C" was allocated in Annexure F of the First Report.

39. Given the respondent's proposed answer to Supplementary Question 1, the Referee is not required to answer Supplementary Question 4(b).

40. Given the proposed answers to Supplementary Questions 1, 3, 4(a) and 4(b), there is no evidence that the 2020 countermeasures were required to address fuel consumption or fuel economy in the Relevant Vehicles.

Efficacy of the 2020 countermeasures

41. The respondent's Summary for the Referee in Response to Category 2(c)(v) of the Referee's Required Supplementary Reference Documents (**respondent's Summary**) [46] provides a series of key metrics in relation to the progress and efficacy of the 2020 countermeasures by reference to the total number of Relevant Vehicles. Dealers are required to submit reimbursement claims by reference to claim codes reflecting the nature of the repair, countermeasure or other fix applied by the Dealer. The data in the respondent's Summary is directly sourced from an analysis of reimbursement claims submitted by Dealers which are captured by the respondent's WINPAQ system.

42. For the purposes of assessing the efficacy of the 2020 countermeasures, an appropriate starting point is the fact that there are **264,170 Relevant Vehicles**, of which **109,918 Relevant Vehicles (41.6%)** have *not* had any DPF-related reimbursement claims made by Dealers.[47] By reference to the First Report, these 109,918 Relevant Vehicles have not, to the respondent's knowledge, experienced any of the Vehicle Defects and/or Vehicle Defect Consequences.

[46] TAL.100.157.0130
[47] TAL.100.157.0130

The 2020 Field Fix

43. The respondent submits that its internal testing of the 2020 Field Fix demonstrates that, in accordance with the respondent's processes, the 2020 Field Fix was effective in the sense of being appropriate to implement in the field[48] and has subsequently proven to be "effective".[49]

44. During the implementation of the 2020 Field Fix, **21,940 Relevant Vehicles** had had the 2020 Field Fix applied (**8.3%** of the total number of Relevant Vehicles). Of those, only **289 Relevant Vehicles** had DPF-related reimbursement claims made by Dealers following the implementation of the 2020 Field Fix. This represents **1.32%** of the number of Relevant Vehicles that have had the 2020 Field Fix applied, and **0.11%** of the total number of Relevant Vehicles.[50]

45. Having regard to the relevant records, there are various reasons for a Dealer to have submitted such a claim. They include:

(a) The Dealer submitted a claim which identified that the Relevant Vehicle had had the 2020 Field Fix when it had not. Therefore, any subsequent repair was not following the implementation of the 2020 Field Fix.

(b) The Dealer Repair Order indicates that a second reimbursement claim for the 2020 Field Fix was performed as an outstanding customer service exercise, as opposed to a remedy for a Relevant Vehicle experiencing Vehicle Defects and/or Vehicle Defect Consequences. To the best of the respondent's knowledge these Relevant Vehicles have not experienced a Vehicle Defect and/or Vehicle Defect Consequences after the 2020 Field Fix.

(c) The Dealer incorrectly submitted a DPF claim code for a repair in a Relevant Vehicle that did not relate to the DPF.

(d) The Dealer Repair Order indicates that a customer may have been experiencing Vehicle Defects and/or Vehicle Defect Consequences. However, the Dealer has not contacted the respondent's Technical Helpdesk as they usually would if an issue arose following the implementation of a countermeasure.

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[48] See for example, TAL.100.142.0062 at 0062 (Technical report - TMCA Vehicle Evaluation - Quality Field Issue Support for AD, GD, KD, VD EDER, 24 February 2020), TCO.001.002.0733 at 0003 (Presentation - GD White Smoke Post CSC Oct 18, 6 December 2019)

[49] See for example, TAL.100.142.0025 at 0025, 0026, 0029, 0031 and 0033 (Technical report - TMCA Vehicle Evaluation - Quality Field Issue Support for AD, GD, KD, VD EDER, 29 June 2020), TAL.100.144.0204 (Converter Assy - White Smoke - P2463 - In Field Countermeasure Trial (Au-CQE x VED x TICO), 3 July 2020), TAL.100.132.0104 (Converter Assy - White Smoke - P2463 - In Field Countermeasure Trial (Au-CQE x VED x TICO), 3 July 2020), TAL.100.142.0001 at 0016 (Presentation - TMCA - Vehicle Evaluation - 'War Room' Agile Processes and Results (Confidential), 27 July 2020), TAL.001.488.5439 (Meeting Minutes - GD Engine, White Smoke, POST CSC Oct 18' (GR Follow Up), 9 October 2019), TCO.001.001.1259 (Meeting Minutes - GD White Smoke POST CSC Oct 18, 6 November 2019), TAL.100.132.0072 (Meeting Minutes - GD Engine, White Smoke, POST CSC Oct 18' - POST MY18 Tech Change (GR Follow Up), 20 February 2020), TCO.005.005.0900 at 0002 and 0008 (Presentation - GD White Smoke Post CSC Oct 18, 20 February 2020) , TAL.100.132.0073 at 0077 (Presentation - GD White Smoke Post CSC Oct 18 (draft), 27 March 2020), TAL.100.132.0097 at 0098 (Presentation - GD White Smoke Post CSC Oct 18 (draft), 9 June 2020), TAL.100.152.0009 (Meeting Minutes - GD Engine, White Smoke, P2463 (GR Follow Up Meeting), 2 July 2020), TAL.100.149.0012 at 0014 (Presentation - GD White Smoke Post CSC Oct 18 (draft), 2 July 2020)

[50] TAL.100.157.0130

(e) The Dealer submitted a further claim to the respondent in relation to a previous repair. The apparent second claim was not a repair.

46. The respondent submits that it is highly unlikely that the 289 Relevant Vehicles that had DPF-related reimbursement claims made by Dealers following the implementation of the 2020 Field Fix experienced ongoing or further Vehicle Defects and / or Vehicle Defect Consequences.

47. The procedures in place between the respondent and Dealers are configured to encourage Dealers to report product issues, in part because this is the way they escalate product related issues. This escalation process involves contacting the respondent's Technical Helpdesk in the first instance and then, if required, submitting a Dealer Product Report.

48. These proceedings and the circumstances that give rise to them:

(a) are well known to Dealers;

(b) have been extensively reported in the Australian media and online; and

(c) in particular, have been brought to the attention of <u>all</u> Group Members through a Court ordered notification process.

49. No Dealer Product Reports have been submitted by Dealers with respect to any Relevant Vehicles experiencing a Vehicle Defect and/or a Vehicle Defect Consequence following the implementation of the 2020 Field Fix.[51] In the event that the 2020 Field Fix was not proving to be efficacious, given the procedures outlined above, it is reasonable for the respondent to expect that it would have received such reports.

<u>The 2018 Production Change</u>

50. As at 28 February 2021, **98,861** Relevant Vehicles had had the 2018 Production Change applied (**37.4%** of the total number of Relevant Vehicles).[52] Of those, only **578** Relevant Vehicles had DPF-related reimbursement claims made by Dealers following the implementation of the 2018 Production Change.[53] This accounts for only **0.58%** of the number of Relevant Vehicles that have had the 2018 Production Change applied, and **0.22%** of the total number of Relevant Vehicles.[54]

Conclusion

51. The respondent contends that efficacy is best evaluated through an informed subjective assessment based on objective data. The respondent submits that the 2020 countermeasures have been effective for the following reasons:

[51] Please refer to TAL.100.157.0130 for an explanation of Dealer Product Reports. See also, TAL.100.141.0001 at 0011 (ADSL TADSL-0027-2020 - DPF Changes - SVP up to 31/05/2018 (MY17), 21 December 2020)
[52] TAL.100.157.0130
[53] TAL.100.157.0130
[54] TAL.100.157.0130

(a) **Firstly**, when a vehicle presents to a Dealer with a Vehicle Defect and/or a Vehicle Defect Consequence, the issue is capable of being resolved by applying the 2020 Field Fix.

(b) **Secondly**, only **8.3%** of the total number of Relevant Vehicles have thus far had the 2020 Field Fix applied in circumstances where the balance of Relevant Vehicles continue to be effective for consumer use.[55]

(c) **Thirdly**, only **1.32%** of the number of Relevant Vehicles that have had the 2020 Field Fix applied have had any further DPF-related reimbursement claim made by Dealers.[56] It is also important to take into account the un-related reasons for these reports as detailed above in paragraph 45.

(d) **Fourthly**, in turn, this means that up to **0.11%** of the total number of Relevant Vehicles have had any further DPF-related reimbursement claim made by Dealers following the implementation of the 2020 Field Fix.[57]

(e) **Fifthly**, Dealers have not communicated or escalated any ongoing issues to the respondent by submitting a Dealer Product Report following the implementation of the 2020 Field Fix.

(f) **Sixthly**, this proceeding does not concern a safety-based product action. There is no risk to consumers or the general public as a result of any of the Vehicle Defects and/or a Vehicle Defect Consequences.

(g) **Seventhly**, the respondent's experience is that the requirement for ongoing investigation and *kaizen* (continuous improvement) by the respondent is very low compared with action required for earlier countermeasures in this regard, which is a practical measure of efficacy.

52. In response to Supplementary Question 4(a), in the circumstances and having due regard to its decades of experience as an Australian distributor of motor vehicles, including light diesel vehicles, supplied in the Australian market, the respondent submits that it is reasonable to assess the results of the 2020 countermeasures as having been and continuing to be effective.

53. In light of the respondent's proposed answer to Supplementary Question 1, the Referee is not required to answer Supplementary Question 4(b).

54. Supplementary Question 4(c) proceeds upon a misapprehension that the 2020 countermeasures were designed to address fuel consumption or fuel economy in a way that is material to the issues raised in these proceedings. The proposed answers to Supplementary Questions 1, 3, and 4(a) mean that there is simply no evidence available to the respondent, or

[55] TAL.100.157.0130
[56] TAL.100.157.0130
[57] TAL.100.157.0130

the Referee, which suggests that the 2020 countermeasures were required to address fuel consumption or fuel economy in the Relevant Vehicles.

A E Munro

X Teo

CLAYTON UTZ

9 April 2021

Kenneth John Williams & Anor v Toyota Motor Corporation Australia Limited

APPLICANTS' RESPONSE

A INTRODUCTION

1 This Response (**Response**) to Toyota's Statement of Contended Findings (**Toyota's Statement**) and Submissions in Chief dated 9 April 2021 (**Toyota's Submissions**) is submitted by the Applicants pursuant to Order 6(h) made by the Court on 19 January 2021 and Rule 28.65(7) of the *Federal Court Rules 2011* (Cth).

2 Capitalised terms used in this Response have the same meanings as in the Applicants' Statement of Contended Findings dated 9 April 2021 (**Applicants' Statement**).

3 For the reasons set out below, the Supplementary Questions should be answered as contended by the Applicants in the Applicants' Statement and not as contended in Toyota's Statement.

B DESIGN DEFECT

4 Neither Toyota's Statement nor Toyota's Submissions provide a compelling explanation as to why the DPF System was designed to rely almost exclusively on Active Regeneration to regenerate the DPF and why NO_2 Oxidation and Passive Regeneration were ignored. The absence of such an explanation is telling in circumstances where Passive Regeneration has inherent advantages over Active Regeneration[1] and where alternative designs are available and widely used in the industry.[2] It should be inferred that no compelling explanation exists.

5 Instead of explaining the rationale for Toyota's design of the DPF System, the Respondent identifies three reasons it contends the design is not defective. None is persuasive.

6 First, the Respondent submits that NO_x emissions reduction techniques employed to seek to comply with NO_x emissions regulations reduce the PM Ratio to a level which is generally insufficient to consistently trigger Passive Regeneration. This is no answer to the contention the design of the DPF System is defective. Any design choice must be made in the context of the regulatory frameworks within which the system must operate. If Toyota cannot design a system which is not defective within the relevant regulatory framework, this does not excuse the defective design. The premise of the Respondent's submission is that that the *only* available response to the dampening effect of NO_x emissions reduction techniques on Passive Regeneration rates is to abandon Passive Regeneration and rely exclusively on Active Regeneration. As submitted in the Applicants' Statement and as demonstrated by other OEMs (as described below), this is simply not the case. Other designs which balance Passive and Active Regeneration are available and widely used in the industry.

7 Secondly, the Respondent relies on the fact that predecessor Toyota models and variants manufactured for and distributed *in other world markets* also relied principally on Automatic Regeneration. These vehicles are wholly irrelevant to an assessment of whether the design of the DPF System in the Relevant Vehicles, which were manufactured for and distributed *in the Australian market*, was defective. In fact, this submission simply serves to highlight the identity between the design of the DPF System adopted by Toyota for the Relevant Vehicles and the core defect found by the Referee, namely, that "*the DPF System was not designed to function effectively during all reasonably expected conditions of normal operation and use in the Australian market*".[3]

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[1] Applicants' Statement at [8] - [13].

[2] Applicants' Statement at [12] and paragraph 8 below.

[3] Referee's Report at [8].

8 Thirdly, the Respondent contends that its design of the DPF System to rely almost exclusively on Active Regeneration is conventional in light duty diesel vehicles and widely used in the industry. However, Toyota's Submissions only identify 3 manufacturers in support of this contention: (a) Hino, which is a manufacturer of *heavy-duty* diesel vehicles *owned by Toyota* and thus wholly irrelevant; (b) Isuzu, which the Applicants understand from publicly available material distributed 2 light-duty diesel vehicle models in Australia during the Relevant Period; and (c) Mazda, which the Applicants understand from publicly available material distributed 6 light-duty vehicle models in Australia during the Relevant Period (some of which appear to have been discontinued). This represents a very small proportion of the light-duty diesel vehicles manufactured for and distributed in Australia. Based on publicly available data, the Applicants understand that during the Relevant Period, at least 140 models of light-duty diesel vehicles were manufactured for and distributed in Australia by at least 24 different OEMs.[4] Further, none of the documents on which the Respondent relies actually states that the relevant Hino, Isuzu and Mazda models relies *principally* on Active Regeneration to regenerate the DPF. Instead, at their highest, these documents merely suggest that Active Regeneration is one aspect of the regeneration strategies adopted by these OEMs. If the regeneration strategies adopted by these OEMs balance Active and Passive Regeneration, then the design of these systems is fundamentally different to the design of the DPF System in the Relevant Vehicles.

9 Finally, the Respondent's contention at [15] of Toyota's Submissions that use of Automatic Regeneration did not cause the Vehicle Defects or Vehicle Defect Consequences is of no assistance to the Referee in answering Supplementary Question 2. *Firstly*, this contention misstates the Applicants' case. The Applicants do not contend that mere use of Active Regeneration caused the Vehicle Defects and their consequences or that Active Regeneration should form no part of an OEM's regeneration strategy, but rather that it should not comprise the entirety of that strategy. It is Toyota's almost *exclusive* reliance on Active Regeneration which the Applicants contend is problematic and has contributed to the Relevant Vehicles suffering the Vehicle Defects and their consequences. *Secondly*, the Applicants' position is not inconsistent with any of the findings already made by the Referee. In fact, the Referee's findings support the Applicants' design defect contentions.[5] *Thirdly*, the Respondent's reliance on the asserted efficacy of the 2020 Countermeasures to defend the design of the DPF System is illogical and flawed. For the reasons set out in Section D below, the ongoing efficacy of the 2020 Countermeasures has not been established. Further, even if the ongoing efficacy of the 2020 Countermeasures was able to be established, this would simply demonstrate that after multiple unsuccessful attempts over a period of four years, Toyota had managed to resolve problems with the *implementation* of its defective design. It would not demonstrate that Toyota's original design choice, which exposed consumers to four years of higher risks of the Vehicle Defects and their consequences manifesting, was not flawed when compared with other available designs. For the reasons set out in [15] of the Applicants' Statement, Toyota's design defect contributes to the Vehicle Defects and/or Vehicle Defect Consequences.

C FUEL CONSUMPTION

C1 The Respondent provides no basis to support answering Supplementary Question 3 "no"

10 Toyota's Submissions provide <u>no basis</u> to support the Respondent's contention that Supplementary Question 3 should be answered "no". The Respondent wholly fails to address (or even grapple with) the logical propositions and extensive evidence outlined in the Applicants' Statement which clearly demonstrate that Relevant Vehicles manifesting the Vehicle Defects and/or Vehicle Defect Consequences consume additional fuel as a result of these defects and/or consequences.[6] Supplementary Question 3 <u>must</u> therefore be answered "yes". Instead, the *only* submissions advanced by the Respondent relate to the *quantification* of this increased fuel consumption. For the reasons outlined below, the Respondent's submissions in respect of

[4] See Schedule 1 to this Response.

[5] See for example, Referee's Report at [39].

[6] Applicants' Statement at [17] – [25].

quantification should be rejected, however even if they were accepted, they provide no basis to support the Respondent's contention that Supplementary Question 3 should be answered "no".

11 Further, the Referee should reject the proposed findings for which the Respondent contends at [12(a) and (b)] of Toyota's Submissions. These proposed findings significantly mischaracterise the findings at [19] and [70] of the Referee's Report, both of which were expressly couched as statements about the limits of the conclusions the Referee was able to draw in the absence of objective data. Compelling objective data has now been provided which demonstrates beyond doubt that Supplementary Question 3 must be answered "yes". The Applicants also highlight that the Respondent's contention in [12(b)] is notably silent about whether an increase in the *duration* of Active Regeneration has a detrimental impact on fuel economy. The Applicants have already shown that it does and that the Relevant Vehicles suffer from an increase of both the frequency and duration of Active Regeneration (with a consequent deterioration in fuel economy).[7]

C2 The Respondent's submissions in respect of quantification are unpersuasive

12 The Respondent's submissions in respect of quantification may be distilled into the assertions that: (a) it is not possible to quantify *any* additional fuel consumption resulting from the Vehicle Defects and/or Vehicle Defect Consequences other than by examining each individual vehicle in the class and its driving history; and (b) the fuel consumption analysis conducted by its own engineers is wholly unreliable. For the reasons below, both submissions are unpersuasive and should be rejected.

C2.1 It is possible to determine a reasonable estimate of increased fuel consumption

13 The Respondent's first submission elides the difference between quantifying increased fuel consumption in *each and every* Relevant Vehicle and determining a logical and reasonable estimate of the quantum of the increased fuel consumption suffered by Relevant Vehicles manifesting the Vehicle Defects and their consequences. The former exercise does not need to be undertaken to answer the second aspect of Supplementary Question 3(a). Further, that the former exercise may require examination of individual vehicles does not mean that the latter exercise does, or that it is *impossible* to quantify *any* increased fuel consumption suffered by Relevant Vehicles manifesting the Vehicle Defects and their consequences without such an examination.

14 The Applicants submit that it is possible to calculate a logical and reasonable estimate of the quantum of increased fuel consumption suffered by Relevant Vehicles manifesting the Vehicle Defects and their consequences by employing the methodology suggested by the Applicants and used by Toyota's own engineers to conduct the 11 vehicle analysis. That is, by measuring the Excess Active Regeneration experienced by the vehicles and calculating the impact of this Excess Active Regeneration on the vehicles' fuel consumption by reference to the fuel consumption rates stated in the certification materials for these vehicles.[8] It is notable that despite engaging in extensive ex-post criticism of the Toyota Fuel Consumption Study, the Respondent does not substantively challenge the appropriateness of the underlying methodology adopted in the 11 vehicle analysis. Indeed, the Respondent's first submission is wholly undermined by the fact that the Toyota Fuel Consumption Study was conducted. Self-evidently, Toyota's own engineers did not consider it impossible to quantify the increased fuel consumption suffered by Relevant Vehicles manifesting the Vehicle Defects and their consequences. The Respondent's submission also ignores the fact that the methodology suggested by the Applicants and used by Toyota's engineers to conduct the 11 vehicle analysis involves analysis of actual real-world data regarding the driving histories of individual Relevant Vehicles.

[7] Applicants' Statement at [17] – [25].
[8] Applicants' Statement at [26] – [27].

C2.2 The 11 vehicle analysis provides a reasonable basis for estimating increased fuel consumption

15 As set out in [28(e)] and Annexure A of the Applicants' Statement, the Applicants' contention that the second aspect of Supplementary Question 3(a) should be answered "*in the amount of at least 5.2%*" is based on the 11 vehicle analysis. As noted above, the Respondent does not substantively criticise the methodology underlying the 11 vehicle analysis. Rather, the Respondent contends that specific steps of this analysis and specific inputs into it are not reliable.[9] The steps of the analysis with which the Respondent takes issue are subsequent to (and do not effect) those from which the Applicants' derive the average fuel consumption deterioration across the Toyota Study Vehicles of 5.2%.[10] As such, the Respondent's criticism of these subsequent steps is of no moment. Similarly, for the reasons set out in paragraphs 16 to 21 below, the Respondent's complaints about the reliability of the inputs to the 11 vehicle analysis are unpersuasive and should be rejected.

16 The Respondent's submission that the 11 vehicle analysis is unreliable because it is based on raw data extracted from the ECUs of the Toyota Study Vehicles rather than on *"testing"* is specious. The Respondent does challenge the logical proposition that Excess Active Regeneration results in increased fuel consumption. Whether one labels the exercise testing or analysis, the most obvious and logical way for Toyota's engineers to have measured the frequency and duration of Active Regeneration experienced by the Toyota Study Vehicles (to determine the extent to which it was excessive) was to analyse data extracted from their ECUs. Notably, the Respondent does not challenge the *authenticity or accuracy* of the relevant data.

17 The Respondent's submission that the 11 vehicle analysis is unreliable because it assumes the 11 vehicles all have the same fuel consumption as a "normal vehicle" is misguided and should be rejected.[11] There was nothing inherently unreliable about Toyota's engineers assuming consistent fuel consumption rates for the 11 Toyota Study Vehicles when undertaking an analysis in the nature of the 11 vehicle analysis in which the "variable" being measured was the impact of the Excess Active Regeneration experienced by the vehicles on their fuel consumption and where the fuel consumption rates assumed are derived directly from the certification materials for the Relevant Vehicles. Similarly, there was nothing inherently unreliable or illogical about Toyota's engineers comparing the fuel consumption rates calculated for the Toyota Study Vehicles against a base fuel consumption rate which reflected the certification materials for the Relevant Vehicles. Unless the Respondent's position is that the certification materials submitted to the regulatory authorities in respect of the Relevant Vehicles are wholly unreliable, relying on these materials appears to the Applicants (and it seems also to Toyota's engineers) to be the simplest and least contentious way of calculating fuel consumption rates for the Toyota Study Vehicles for the purposes of the Toyota Fuel Consumption Study.

18 The Respondent's focus on the "normal vehicle" being a 2GD Hilux is also misplaced. The base fuel consumption rates used in the Toyota Fuel Consumption Study in fact appear to align with those stated in the certification materials for a Prado.[12] In any event, given the limited variance between the fuel consumption rates for the Prado and the 1GD and 2GD Hilux models, the selection of a different "base" Relevant Vehicle would not have significantly changed the results of the 11 vehicle analysis. As the table below shows, substituting either a 1GD or 2GD Hilux for the Prado would in fact increase the average fuel consumption deterioration rates shown in Sheet 9, Column L of TJL.020.002.0037.

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[9] See [29] – [34] of Toyota's Submissions regarding inputs and [35] – [36] regarding subsequent steps.

[10] Applicants' Submissions at [28(f)] and Annexure A, [5].

[11] The Applicants note that the Respondent's submission misstates and overly simplifies the relevant analysis and directs the Referee to their explanation of the analysis at Annexure A of the Applicants' Statement.

[12] TAL.100.061.4018 at .4042; TCO.999.003.0006 at .0006.

Model	Fuel Consumption during regeneration (TCO.999.003.0006)	Fuel Consumption when not regenerating (TCO.999.003.0006)	Fuel Consumption during regeneration converted to amount for 1 cycle in NEDC Mode (per the formula in Sheet 10, cell C5 of TJL.020.002.0037)	Total "Normal Vehicle" Fuel Consumption (per the formula in Sheet 10, cell C11 of TJL.020.002.0037)	Average fuel consumption deterioration[13]
Prado	10.08 L/100km (at .0006)	7.78 L/100km (at .0006)	12.38 L/100km	7.92 L/100km	5.7%
1GD Hilux	11.70 L/100km (at .0007)	8.68 L/100km (at .0007)	14.72 L/100km	8.88 L/100km	6.4%
2GD Hilux	10.55 L/100km (at .0008)	7.18 L/100km (at .0008)	13.92 L/100km	7.37 L/100km	9.1%

19 On the other hand, the range of Relevant Vehicles covered by the 11 Toyota Study Vehicles highlighted in footnote 40 of the Respondent's Submissions provides further support for the reasonableness of the Toyota Fuel Consumption Study as a basis for estimating how the Excess Active Regeneration experienced by Relevant Vehicles manifesting the Vehicle Defects and their consequences adversely impacts the fuel economy of those vehicles.

20 The Respondent's submission that the 11 vehicle analysis is unreliable because the ECU data used in the analysis represented "*only a small fraction of the total distance travelled by each of the 11 vehicles*" and thus may not be indicative of the vehicles' overall performance is without merit and should be rejected. This submission is wholly undermined by the table in footnote 41 of the Respondent's Submissions which shows that the data for the 5 vehicles shown in the table was collected while these vehicles travelled between approximately 4,000kms and 17,000kms (between approximately 4.6% and 16% of their total mileage). These are not trivial distances or proportions of use. In fact, they are similar to the trial distances employed by Toyota in testing the 2020 Countermeasures.[14]

21 Finally, the Respondent's submission that the 11 vehicle analysis is unreliable because it contains "*unreliable*" results is not borne out by analysis and should be rejected. *First*, the necessary corollary of the Respondent's submissions in [33] and [34] that it is "*contradictory and absurd*" for some vehicles stated to be blowing white smoke to have achieved better fuel economy than "normal vehicles" and for a "normal vehicle" to have achieved the worst fuel economy, is that the Respondent must accept that vehicles blowing white smoke (and thereby manifesting the defect) would be expected to experience worse fuel economy than vehicles not manifesting the defect. This is precisely the Applicants' contention and diametrically opposed to the Respondent's contention that the defects do not worsen fuel economy. *Secondly*, the Respondent's submission that all of the "normal vehicles" in Sheet 12 of TJL.020.002.0037 (Normal Vehicles) achieved significantly worse fuel economy than the base "normal vehicle" simply highlights that even Relevant Vehicles not yet manifesting the Vehicle Defects and their consequences do not achieve the fuel economy stated in their certification materials. *Thirdly*, the Respondent's submission that the average decline in fuel economy of the "normal vehicles" in the Normal Vehicles worksheet is greater than the average decline in fuel economy in the defective vehicles is incorrect.[15]

22 If, notwithstanding the submissions above, the Referee is not satisfied that the 11 vehicle analysis provides a reasonable basis for estimating the increased fuel consumption experienced

[13] Simple average of Sheet 9, Column L, Rows 3 to 24 of TJL.020.002.0037 when fuel consumption figures from columns 2 and 3 of the table are substituted into cells C4 and C3 of Sheet 10, respectively and corresponding regeneration cycle numbers from TCO.999.003.0006 are applied in cell D11 of Sheet 10.

[14] See for example, TJL.002.001.0440 at _0004.

[15] Compare TJL.020.002.0037 at Sheet 9, column L (simple average of rows 4 to 24) with TJL.020.002.0037 at Sheet 12, column L (simple average of rows 3 to 15).

by Relevant Vehicles manifesting the Vehicle Defects and/or their consequences, the Applicants contend that the appropriate course is for fresh testing of the kind described in [26] of the Applicants' Statement to be conducted.

23 The Applicants do not propose to address the issues raised by the Respondent in respect of the single vehicle analysis because they do not impact the 11 vehicle analysis which supports the Applicants' contention that the second aspect of Supplementary Question 3(a) should be answered "*in the amount of at least 5.2%*". However, the Applicants note that they do not agree with many of the issues raised by the Respondents in respect of this analysis.

D 2020 COUNTERMEASURES

24 The Respondent contends that the 2020 Countermeasures, defined as the 2018 Production Change and the 2020 Field Fix, have been effective in remedying the Vehicle Defects and Vehicle Defect Consequences. In circumstances where the Respondent adopted, without qualification, the Referee's finding that countermeasures implemented by Toyota *during* the Relevant Period (necessarily comprising all countermeasures other than the 2020 Field Fix, given the Referee's explicit definition of the countermeasures implemented *after* the Relevant Period in terms which correspond to the 2020 Field Fix[16]), were ineffective,[17] the Applicants understood the Respondent's contention in respect of the 2018 Production Change to be that this countermeasure was effective *in combination with* the 2020 Field Fix. That is, when applied to vehicles in which the 2018 Production Change had been implemented, the 2020 Field Fix was effective. The Applicants submit that this is the only contention it is now open to the Respondent to make given its previous unqualified adoption of the Referee's clear finding that the 2018 Production Change was ineffective. On 20 April 2021, the Respondent indicated that contrary to the position taken in adopting the Referee's Report, it now asserts the 2018 Production Change was effective by itself.[18] The Referee should not entertain the Respondent's late attempt to fundamentally change the meaning of the Referee's findings by reference to which Supplementary Question 4 was framed.

25 In any event, the Respondent's submission that the 2018 Production Change was itself effective is not supported by logic. If the 2018 Production Change, which involved an ECM programming change and the installation of the DPF Switch, had itself been (and was expected to continue to be) wholly effective, there would have been no need to implement the 2020 Field Fix, which involves replacing fundamental mechanical components of the DPF System (namely, the DOC, Additional Injector and Additional Injector housing assembly). It is these later changes which the Referee stated appeared designed to eliminate the root causes of the core defect in the DPF System. The logical consequence of that finding, which the Respondent enthusiastically embraces, is that the earlier countermeasure (which is fundamentally different) cannot have been effective to eliminate the core defect. Furthermore, the ineffectiveness of this earlier countermeasure is demonstrated by Toyota's own documents.[19]

26 The Applicants also highlight that the Respondent's contention at [15(b)] of Toyota's Statement (repeated at [51] of Toyota's Submissions) that Relevant Vehicles to which the 2020 Field Fix has not been applied (comprising approximately 92% of the total number of Relevant Vehicles) "*continue to be effective for consumer use*" is entirely without merit and should be rejected. It is a contention which is fundamentally inconsistent with: (a) the Referee's findings that all Relevant Vehicles suffered an inherent core defect for the entire Relevant Period; and (b) Toyota's own WINPAQ data which indicates that DPF related reimbursement claims have been

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[16] See Referee's Report, [12] and [50], and Toyota's Defence, [47(i)], and compare with Referee's Report, [11] and [46].

[17] Referee's Report [11] and [46].

[18] Letter from BLCA to Clayton Utz dated 16 April 2021; Letter from Clayton Utz to BLCA dated 20 April 2021.

[19] See for example: TJL.006.001.0001 at .0001; TAL.001.487.4669 at .4669; TAL.001.496.6989 at .7004 and .7005; TAL.001.277.3471 at .3482; TCO.001.001.2721 at .2721.

made by Dealers in respect of over 154,000 Relevant Vehicles (approximately 60% of the total number of Relevant Vehicles).[20]

27 The Respondent relies almost exclusively on its summary of WINPAQ data in support of its contentions as to how Supplementary Question 4 should be answered. There are two primary problems with this exclusive reliance on the WINPAQ data. *First*, the Respondent does not address the matters outlined in Sections D2.2 to D2.4 of the Applicants' Statement which demonstrate that significant doubt remains as to the ongoing, real-world efficacy of the 2020 Countermeasures across the class of Relevant Vehicles. *Secondly*, the WINPAQ data alone does not demonstrate (and is not capable of demonstrating) that the 2020 Countermeasures have been and/or will continue to be effective. The Respondent's own testing and analysis of the 2020 Countermeasures demonstrates that their efficacy declines over time.[21] This is a similar story. In circumstances where only a relatively short period of time has transpired since the 2020 Field Fix began to be implemented, the Applicants contend that a comparatively lower number of DPF related reimbursement claims alone at this point in time does not provide a reasonable basis for finding that these countermeasures are and will continue to be effective over the life of the Relevant Vehicles. Instead, the Applicants contend that it is probable this simply reflects the limited time the 2020 Field Fix has been in the market. It is difficult for the Applicants to quantify how limited this period has been because the summary of the WINPAQ data produced by the Respondent to date does not allow the Applicants to determine *when* the 2020 Field Fix was applied to the 8.3% of Relevant Vehicles to which these countermeasures have been applied. Despite repeated requests, the Respondent has not provided the Applicants with complete WINPAQ data for the period since 1 May 2020.[22]

28 Furthermore, the Respondent's exclusive reliance on the WINPAQ data: (a) ignores DPF related repairs conducted by mechanics other than Toyota Dealers (thereby potentially understating the incidence of Relevant Vehicles manifesting the Vehicle Defects and their consequences after the 2020 Field Fix has been applied); and (b) assumes the accuracy and completeness of the WINPAQ data (something which is undermined by the Respondent's own submissions casting doubt on the accuracy of the data).

23 April 2021

[20] Toyota's Submissions, [42].

[21] See for example: *"Carbon Coking Test"* graph in TAL.100.152.0007 at .0007 and in TAL.100.132.0092 at .0093.

[22] Letter from BLCA to Clayton Utz dated 9 March 2021; Letter from BLCA to Clayton Utz dated 25 March 2021; Letter from Clayton Utz to BLCA dated 29 March 2021; Letter from BLCA to Clayton Utz dated 15 April 2021.

SCHEDULE 1

Light-duty diesel vehicles Applicants understand were sold in Australia during the Relevant Period

1 **Alfa Romeo**: Stelvio, Giulia

2 **Audi**: A3, A4, A5, A6, A7, A8, Q2, Q3, Q5, Q7, Q8, SQ5, SQ7, SQ8

3 **Bentley**: Bentayga

4 **BMW**: 1 series, 2 series, 3 series, 4 series, 5 series, 6 series, 7 series, X1, X2, X3, X4, X5, X6, X7

5 **Ford**: Endura, Escape, Everest, Mondeo, Ranger, Kuga, Territory 7)

6 **Holden**: Captiva, Colorado, Colorado 7, Commodore, Cruze, Equinox, Malibu, Trailblazer

7 **Hyundai**: i30, i40, iMax, ix35, Sante Fe, Tucson

8 **Isuzu**: D-Max, MU-X

9 **Jaguar**: E-Pace, F-Pace, XE, XF, XJ

10 **Jeep**: Cherokee, Compass, Grand Cherokee, Wrangler Unlimited

11 **Kia**: Carnival, Sorento, Sportage

12 **Land Rover**: Defender, Discovery, Discovery 4, Discovery Sport, Freelander 2, Ranger Rover, Range Rover Autobiography, Range Rover Evoque, Range Rover Sport, Range Rover Vogue, Range Rover Velar

13 **Lexus**: LX

14 **Maserati**: Ghibli, Levante, Quattroporte

15 **Mazda**: 3, 6, BT-50, CX-3, CX-5, CX-8

16 **Mercedes-Benz**: A-Class, B-Class, C-Class, CLA-Class, CLS-Class, E-Class, G-Class, GL-Class, GLA-Class, GLC-Class, GLE-Class, GLS-Class, M-Class, S-Class, Sprinter, V-Class, Valente, Vito, X-Class

17 **Mini**: Countryman, Cooper

18 **Mitsubishi**: ASX, Challenger, Outlander, Pajero, Pajero Sport, Triton

19 **Nissan**: Navara, Patrol, Qashqai, X-Trail

20 **Porsche**: Cayenne, Macan, Panamera

21 **Subaru**: Forester, Outback

22 **Suzuki**: Vitara

23 **Volkswagen**: Amarok, California, Caravelle, Golf, Jetta, Multivan, Passat, Tiguan, Touareg

24 **Volvo**: S60, S90, V40, V60, V90, XC90, XC60, XC90

FEDERAL COURT OF AUSTRALIA **NSD 1210 OF 2019**
DISTRICT REGISTRY: NSW
DIVISION: GENERAL

Kenneth John Williams
First Applicant

Direct Claim Services QLD Pty Ltd
ACN 167 519 968
Second Applicant

Toyota Motor Corporation Australia Limited
Respondent

SUPPLEMENTARY REFERENCE

RESPONDENT'S RESPONSE TO THE APPLICANTS' SUBMISSIONS IN CHIEF

1. On 9 April 2021, in accordance with paragraph 6(g) of the Orders made on 19 January 2021 (**January Orders**), the applicants and the respondent each provided the Referee with a Statement of Contended Findings, referred to as the "**applicants' submissions in chief**" and the "**respondent's submissions in chief**" respectively.

2. Paragraph 6(h) of the January Orders permits each party to provide to the Referee and to the other party a written response to the other party's submissions in chief. The respondent's response to the applicants' submissions in chief is set out in in the submissions attached as Annexure A.

The respondent's response to applicants' submissions in chief was prepared and settled by Clayton Utz, solicitors for the respondent and A E Munro and X Teo of Counsel.

ANNEXURE A

I. SUPPLEMENTARY QUESTIONS 1 AND 2 - DESIGN DEFECT

3. The applicants' submissions in chief in relation to Supplementary Questions 1 and 2 should be rejected for the reasons set out below.

4. ***Firstly***, the references upon which the applicants purport to rely are routinely cited incorrectly or inaccurately. In so doing, the applicants have represented that a pinpointed reference supports the contention being made when it does not, in fact, do so.[1]

5. ***Secondly***, the applicants assert that NO_2 Oxidation occurs during normal operation of light duty diesel vehicles in ordinary driving conditions.[2] This is factually inaccurate. As noted by the Referee in the First Report:

> *…passive regeneration would only happen during sustained operation at or above 90% of maximum torque, as would only be achieved when operating a heavily-loaded vehicle, when towing a heavy trailer, or prolonged uphill driving.*[3]

6. Passive Regeneration by NO_2 Oxidation may only occur when the temperature of the exhaust gas passing through a DPF is at least 300°C ***and*** there is a sufficiently ***high*** level of NO_X ***and*** there is a sufficiently ***low*** level of particulate matter present. The ratio of particulate matter to NO_X is a critical factor in the occurrence of Passive Regeneration by NO_2 Oxidation. The stringent NOx and particulate matter emissions limits applicable to light duty vehicles mean that Passive Regeneration by NO_2 Oxidation is problematic in such vehicles. It is therefore for good reason that the Toyota DPF relies on thermal oxidation, which will primarily occur during Active Regeneration.

7. It is inaccurate, and would be an error, to conflate the potential occurrence of Passive Regeneration in light duty diesel vehicles with the occurrence of Passive Regeneration in heavy duty diesel vehicles. Passive Regeneration occurs more frequently and readily in heavy duty diesel vehicles.[4]

8. ***Thirdly***, the applicants have incorrectly asserted that "*DPF systems are typically configured to optimise NO_2 Oxidation, and therefore Passive Regeneration."* [5] This submission is contrary to:

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[1] The following are examples from the applicants' submissions in chief:
(A) the article referenced at footnote 4 is an examination of heavy duty diesel vehicles but the applicant has applied it to light duty diesel vehicles;
(B) the contention at [7] that "…*Thermal Oxidation will only occur during Active Regeneration*" is not what is stated in footnote 47 of the First Report, which refers only to the occurrence of Passive Regeneration;
(C) the contention at [9] is not what is stated in the pinpoint references of TAL.001.534.7823 and TAL.001.538.7482;
(D) the articles at footnote 9 do not support the assertions made at [12] that Passive Regeneration should be used wherever possible and Active Regeneration only used as a "backstop"; and
(E) the First Report did not find that the choice to utilise Active Regeneration over Passive Regeneration "…necessarily increases the risk (compared to alternative designs) of the Relevant Vehicles developing the adverse characteristics which have manifested…", as asserted by the applicant at [14].
[2] Applicants' submissions in chief [7].
[3] First Report, Footnote 47.
[4] Zhixin Shun, Xue Wang, Xiancheng Wang and Jingkai Zhou, *Combustion and emission analysis of heavy duty vehicle engine*, 13 May 2017 [TAL.100.165.0001].
[5] Applicants' submissions in chief [8].

(a) the evidence produced by the respondent as to the deployment of Active Regeneration by both Toyota and by other OEMs;[6] and

(b) an article expressly relied upon by the applicants, which states:

> *Certain applications can be made to work with passive regeneration only, but many modern systems include provisions for active regeneration via fuel combustion when needed, while exhibiting at least limited passive regeneration when conditions are favourable.*[7]

9. ***Fourthly***, the applicants contend that the utilisation of fuel injection into the exhaust during Active Regeneration is the underlying reason that it is a defective design choice. They observe that atomisation of injected diesel fuel is difficult to achieve. They posit that, if the injected diesel fuel does not atomise properly then, when combined with particulate matter, it will form a thick, sooty residue that clogs the DOC and the DPF.[8]

10. This argument is based on a false premise: Active Regeneration can be achieved by injecting diesel fuel into the cylinder or into the exhaust or through a combination of both approaches. Toyota has adopted a combined approach in the design of the DPF System in the Relevant Vehicles.

11. In any event, the applicants' contention in this regard does not inform the question that the Court has asked the Referee to answer. Whether or not fuel injection is used in the process does not, and cannot, make good the specific proposition that the system is defective because it principally relies upon Active Regeneration rather than Passive Regeneration. The argument should be rejected on that basis.

12. Further, in support of the submission at paragraph 9 above, the applicants purport to rely upon the pinpoint references at footnote 7 of the applicants' submissions in chief. The pinpointed extracts contain an unsubstantiated thesis that because the distance between the additional injector and the face of the DOC is less than in other Toyota vehicles, fuel has less time to "atomise" before it hits the face of the DOC. From that, the applicants draw the submission described in paragraph 9 above.

13. The contentions in paragraphs 9 and 11 above, either alone and / or to the extent that they have been conflated together, should also be rejected for the following reasons:

(a) the pinpoint references at footnote 7 of the applicants' submissions in chief are selective extracts from a document created by a trade trained mechanic employed by the respondent (ie, a motor mechanic working in one of the Australian regions in which the respondent is the distributor and not the designer or manufacturer of the

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[6] Respondent's submissions in chief [12], [13], [14].
[7] Srinivasan, A and Price K, *Consolidation of DOC and DPF Functions into a Single Component,"* 2 April 2019, cited at footnote 9 of the applicants' submissions in chief.
[8] Applicants' submissions in chief [9].

Relevant Vehicles), which sets out his own conjecture and what can, at best, be described as a hypothesis[9] created to generate a discussion with one of the respondent's regional offices, but which suggestions are not supported by any independent or corroborative data nor, indeed, knowledge of the technical design parameters of the DPF System;

(b) the distance between the additional injector and the face of the DOC is only one of the design factors that the author of that hypothesis considered may be relevant; the other design factor referred to in the document is the design of the DPF Assembly Inlet, which the Referee has already found to be consistent with current industry practice and did not contribute to the core defect;[10]

(c) the Referee has already found that the use of the additional injector is not a design defect;[11] and

(d) the 2020 countermeasures, which remedied the defects in the DPF System, do not involve any increase in the distance between the additional injector and the face of the DOC.[12]

14. The matters purportedly relied upon by the applicants do not support the contention that the Relevant Vehicles are defective in design, by reason of the fact that they are designed to rely principally on Active Regeneration, rather than Passive Regeneration.

15. The fact that the Relevant Vehicles rely principally upon Active Regeneration, rather than Passive Regeneration, does not, for the reasons set out above, indicate that there was any "… *aspect of design, materials, or workmanship in one or more emission-related parts, components, devices, systems or controls which adversely affects any element of design of the emission control system or the on-board diagnostic (OBD) system from functioning properly."* The reliance upon Active Regeneration is not, and cannot said to be, a "defect".[13]

II. SUPPLEMENTARY QUESTION 3 - FUEL CONSUMPTION

16. The applicants' submissions in relation to Supplementary Question 3 should be rejected for the reasons set out below.

Supplementary question 3(b)

17. It is convenient to first address the applicants' approach to supplementary question 3(b). The respondent submits that question 3(b) does not need to be answered because the answer to question 1 is "no". Further, even if question 1 were answered "yes", question 3(b) has already been answered at paragraph 70 of the First Report where the Referee says:

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[9] See, for example, the reference to "***our understanding*** *of deterioration x time*" in TAL.001.538.7482 at .7489 (emphasis added).
[10] First Report, Annexure F, 39(c).
[11] First Report, Annexure F, 39(e).
[12] Respondent's submissions in chief [17] and [18].
[13] First Report [34].

While it may be accepted that an increase in the frequency of automatic regeneration would involve the consumption of additional fuel, the relative amount of fuel consumed during automatic regeneration is small relative to the amount of fuel consumed to propel the vehicle and, due to the periodic nature of automatic regeneration, is unlikely to have more than a marginal effect on long term fuel efficiency. For this reason, in the absence of any objective data, I cannot conclude that the core defect had any discernible impact on fuel efficiency.

18. The applicants' submissions in chief do not take things further. The applicants have not pointed to anything to suggest that any increase in regeneration would be anything more than "marginal" and would cause "any discernible impact on fuel efficiency". The very fact that the applicants do not provide a percentage for the alleged increase in consumption confirms this.

<u>Supplementary question 3(a)</u>

19. The applicants respond to supplementary question 3(a), initially at a general level and then by relying upon the Worst Case Estimation to support their contended answer.[14] In short, the answer proposed at paragraph 16(a) of the applicants' submissions in chief – namely "in the amount of at least 5.2%" - is derived solely from the 11 vehicle analysis in the Worst Case Estimation, which is fundamentally flawed for the reasons stated in the respondent's submissions in chief and in these response submissions.

20. At a general level, the applicants say that the Vehicle Defects and Vehicle Defect Consequences resulted in additional Active Regeneration and that this increased fuel consumption.[15] The Referee correctly concluded in the First Report (at paragraph 70) that an increase in the rate of Active Regeneration "is unlikely to have more than a marginal effect on long term fuel efficiency" and "[f]or this reason, in the absence of any objective data, … [the Referee] cannot conclude that the core defect had any discernible impact on fuel efficiency". The applicants search for this "objective data" in the Worst Case Estimation. For the reasons explained below, that course simply does not provide any reliable objective data.

21. As explained in the respondent's submissions in chief, the Worst Case Estimation consists of the "single vehicle analysis" and the "11 vehicle analysis". The respondent's position is that both are unreliable and cannot be the basis for any findings by the Referee. The applicants evidently agree with that position for the single vehicle analysis since their submissions do not rely upon it.

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[14] The applicants refer to the Worst Case Estimation as the "Toyota Fuel Consumption Study". Consistent with the respondent's submissions in chief, these submissions refer to it as the Worst Case Estimation. The applicants state that they rely on "multiple" internal Toyota documents (see [23] and [25] of the applicants' submissions in chief). In reality they refer to the various different versions of the Worst Case Estimation and the documents that were used to create it; for example, the spreadsheet containing the data extracted from the 11 vehicles used in the 11 vehicle analysis and Toyota's certification materials. The only document they rely on for their figures for fuel consumption (the 5.2% increase) is the Worst Case Estimation.

[15] Applicants' submissions in chief [19] to [25] and [30].

22. Instead, the applicants' wholly rely upon the 11 vehicle analysis.[16] In addition to the matters canvassed in paragraphs 29 to 36 of the respondent's submissions in chief, the applicants' reliance upon the 11 vehicle analysis is unacceptable for three further reasons.

23. ***Firstly***, even if the 11 vehicle analysis was reliable, which it is not, it does not provide any basis for estimating any increased fuel consumption for all Relevant Vehicles. The 11 vehicle analysis only considers data from a small set of 11 vehicles that had been reported as blowing white smoke in all but one case.[17]

24. The figure of 5.2% cannot sensibly be applied to all Relevant Vehicles or even all Relevant Vehicles exhibiting Vehicle Defect Consequences. This is because it does not, and cannot sensibly, address the duration and degree of issues experienced by different vehicles, different driving patterns and conditions, vehicle models, transmission types, accessories, the application of countermeasures and numerous other variables that apply to the 250,000 plus Relevant Vehicles.

25. ***Secondly***, the applicants ignore the fact that the 11 vehicle analysis accounts for the impact of short trips on fuel consumption. The figure of 5.2%, which was selected by the applicants, does **not** account for short trips.[18]

26. ***Thirdly***, the 11 vehicle analysis relies on fuel consumption figures for regeneration in 1-cycle NEDC mode.[19] There are two problems with this. First, there is nothing to suggest that any of the vehicles in the 11 vehicle analysis were driven in a way that is comparable to the NEDC and even if they were, there is nothing to suggest that the sample of the distance travelled (which was extracted from their ECUs)[20] was representative of the NEDC.

27. Second, no 1-cycle test appears to have been conducted; only a 2-cycle test.[21] The 2-cycle figures from the test are 7.92L/100km for non-regeneration cycles and 10.08L/100km for

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[16] The applicants say the 11 vehicle analysis consists of "approximately 13 Relevant Vehicles" (see paragraph 22 of the applicants' submissions in chief). The number is 11 for the reasons stated in footnote 39 of the respondent's submissions in chief.
[17] There is one vehicle that is not identified as blowing white smoke. It is only identified with the code P2463, which is a Diagnostic Trouble Code for soot accumulation that is stored on the onboard diagnostic system: see column T of the *Appendix 1* worksheet of the Worst Case Estimation.
[18] The applicants have taken the average of column L: see footnote 26 of their submissions. The applicants state that "Toyota conducted further calculations based on the data in Sheet 9: (a) firstly, to seek to exclude the asserted influence of short trips on fuel consumption deterioration, which resulted in the calculation of an alternative average fuel consumption deterioration percentage of 8.8%; …" (paragraph 28(f) of the applicants' submissions in chief). This is misleading because it suggests that if you remove the effect of short trips, the figure 5.2% increases to 8.8% instead of decreasing. The figure of 8.8% is created by removing the effect of short trips and then selectively removing 6 of the 11 vehicles from the analysis so as to get a higher figure.
[19] See cell C5 in the *Summary* worksheet and how this cell is picked up in the formulae in row K of *Appendix 1*.
[20] The respondent's submissions in chief list the percentage that the sample distance represents of the total mileage for 5 of the 11 vehicles: see footnote 41 and [32]. TCO.005.002.3326 allows a percentage to be calculated for an additional five vehicles. These are shown below. These distances do not represent the total mileage of the car but instead represent the distances travelled up to a "post CSE failure". TCO.005.002.3326 shows that this "post CSE failure" occurred in February 2019 which is approximately 7 months before the 11 vehicle analysis. Hence, these distances are smaller than the total mileage and the percentage in the final column should be even smaller.

Vehicle in *Appendix 1*	1. Distance to the "post CSE failure" shown in TCO.005.002.3326	2. Distance considered in *Appendix 1*	Percentage (2/1)
MROHA3FS700040720	33,039km	6,225km	18.84%
MROHA3CD900377234	103,047km	3,532km	3.43%
MROHA3CD700406259	44,061km	5,979km	13.57%
MROEB3CB000443698	54,277km	2,825km	5.20%
MROHA3FS400029092	76,286km	4,564km	5.98%

[21] TCO.999.003.0006 only contains test results with two regeneration cycles.

regeneration cycles.[22] The 1-cycle figures are arrived at by retaining 7.92L/100km then applying arithmetic to obtain 12.24L/100km.[23] The figure of 12.24L/100km is nowhere to be found in the test.[24] It is an arithmetic construct. This is consistent with the theoretical worst case approach in the Worst Case Estimation, which can be seen in numerous other instances such as scaling-up figures by three standard deviations.

28. At paragraph 26 of their submissions in chief, the applicants suggest that a desktop analysis be undertaken to determine the alleged increase in fuel consumption. The respondent submits that, conceptually, each step in the construct presented in subparagraphs 26(a) - (c) is flawed. Addressing each in turn:

(a) For the reasons given in paragraph 11(c) of the respondent's statement of contended findings (see page 3), it is not possible to determine the amount of regeneration experienced by any vehicle that is properly representative of the Relevant Vehicles manifesting the Vehicle Defect Consequences, let alone all of the Relevant Vehicles.

(b) Any comparison to the amount of Active Regeneration, which the respondent's certification materials indicate Relevant Vehicles may experience, is a false comparison for the reasons outlined by the Referee in paragraphs 66 to 69 of the First Report and paragraphs 26 and 27 above. The difference as an absolute value or percentage between regeneration and non-regeneration states are very dependent on the driving profile. The resultant fuel consumption impact could well be zero under numerous potential driving profiles and insignificant under others.

(c) For the same reasons, the fuel consumption rates in the respondent's certification materials do not present a proper point of comparison.

29. In addition, this proposed desktop analysis does not actually measure the fuel consumed by any vehicle. Instead, it measures the percentage of time that they spend in regeneration and non-regeneration and then extrapolates fuel consumption from those percentages. No attempt is made to measure actual fuel consumption.

III. SUPPLEMENTARY QUESTION 4 - 2020 COUNTERMEASURES

30. The applicants' submissions in chief in relation to Supplementary Question 4 should be rejected for the reasons set out below.

31. ***Firstly***, the applicants understanding of the 2020 countermeasures[25] is misconceived for the following reasons:

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[22] See the second and third last rows on page 1 of TCO.999.003.0006.
[23] The figure of 12.24L/100km is arrived at by converting a ratio of 2:29 of regeneration to non-regeneration cycles to a ratio of 1:30. This is done by (i) taking the sum of 7.92x29 and 2x10.08 (which is 249.84); (ii) subtracting 7.92x30 from 249.84 to get 12.24; and (iii) dividing 12.24 by 1 to get 12.24.
[24] The figure of 12.24L/100km is not in the column titled "Comb." in TCO.999.003.0006.
[25] Applicants' submissions in chief [32].

(a) the 2020 countermeasures include:

(i) the 2018 Production Change (first implemented in June 2018 and which continued to be implemented *after* the Relevant Period); and

(ii) the 2020 Field Fix (implemented *after* the Relevant Period);[26] and

(b) the 2020 Field Fix involves (amongst other things), the replacement of the DPF Assembly with a DPF Assembly that contains a Euro 6 DOC unit,[27] not the installation of a Euro 6 DOC unit into the existing DPF Assembly.[28]

32. ***Secondly,*** the respondent submits that, contrary to the applicants' various assertions, the:

(a) modification of the "HC limit",[29] implemented on 12 May 2020;

(b) investigation into a possible "burn up" step;[30] and

(c) any further investigation into DOC build-up,

do not cast doubt over the relative efficacy of the 2020 countermeasures.

33. This is because:

(a) the modification to the HC limit was designed to address instances where small puffs of white smoke were observed when a Relevant Vehicle is driven in extreme circumstances, for example, in an excessive "stop-start" manner, meaning that Active Regeneration could not occur, and does not indicate a Vehicle Defect and/or Vehicle Defect Consequence;[31]

(b) the potential implementation of the burn up step is designed to address a visible accumulation[32] on the DOC in those instances where that may occur and, consistent with the HC limit modification, is not designed for or required to remedy any Vehicle Defects and/or Vehicle Defect Consequences;[33]

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[26] Respondent's submissions in chief [14].
[27] Defence to Further Amended Statement of Claim [47(i)].
[28] The misconception is evident in [32] of the applicants' submissions in chief.
[29] See, for example, TAL.100.132.0073 (Presentation - GD White Smoke Post CSC Oct 18 (draft), 27 March 2020), TAL.100.154.0216 (Meeting Minutes - GD Engine, White Smoke, POST CSC Oct 18' - TICO Visit (10-19th of March) Wrap Up Meeting), 27 March 2020), TAL.100.154.0150 (Presentation - GD Engine - Region Update #4 - Part Supply & TICO Investigation Update, 8 April 2020).
[30] See, for example, TAL.100.152.0008 (Meeting Minutes - GD Engine, White Smoke, P2463 (Burn Up System Information Sharing), 9 June 2020), TAL.100.144.0180 (Presentation - Update Burn Up System Calibration and Carbon Coking, 24 September 2020), TAL.100.149.0070 (Presentation - Update Burn Up System Calibration and Level Up Schedule, 5 November 2020), TAL.100.144.0206 (GD Engine Evaluation (AU x TICO), 18 December 2020). The burn up step is being considered by the respondent for implementation in February 2022, see TAL.100.152.0013 (05.11.2020, 5 November 2020).
[31] TAL.100.132.0072 (Meeting Minutes - GD Engine, White Smoke, POST CSC Oct 18' - POST MY18 Tech Change (GR Follow Up), 20 February 2020), TAL.100.132.0104 (Converter Assy - White Smoke - P2463 - In Field Countermeasure Trial (Au-CQE x VED x TICO), 3 July 2020).
[32] TAL.100.164.0001 (GD Engine Evaluation (AU x TICO), 29 March 2021).
[33] TAL.100.144.0206 (GD Engine Evaluation (AU x TICO), 18 December 2020), TAL.100.132.0104 (Converter Assy - White Smoke - P2463 - In Field Countermeasure Trial (Au-CQE x VED x TICO), 3 July 2020), TAL.100.152.0011 (Meeting Minutes - GD Engine, White Smoke, P2463 (Lvl Up Follow Up Meeting, 10 September 2020).

(c) the modification to the HC limit and the potential implementation of the burn up step are a result of TMCA's extreme testing and do not reflect issues experienced by customers in the field;

(d) the Respondent's Summary,[34] and the underlying WINPAQ data (which were provided to the applicants[35] but were not once referred to in the applicants' submissions in chief) demonstrate that very few Relevant Vehicles have had a DPF-related reimbursement claim made by Dealers following the implementation of the 2020 countermeasures;[36] and

(e) each of the developments or investigations set out at paragraph 32(a) and (b) above are in line with Toyota's core value of *kaizen* (continuous improvement) and are more properly characterised as system improvements, not countermeasures.[37]

34. Further to paragraph 33(e) above, it appears that the applicants are suggesting that the efficacy of the 2020 countermeasures can only be accepted by the Referee if nothing further is now being done in terms of system development or refinement. This overly simplistic approach appears to start from the premise that further product investigation or advancement is rendered unnecessary because:

(a) the issue has been identified;

(b) countermeasures devised and applied; and

(c) there is strong empirical evidence that has validated the success of those countermeasures.

35. The applicants' flawed logic is that if, despite such results (which the respondent submits have, in fact, been achieved to date):

(a) further technical consideration is nevertheless given to the ongoing improvement of the DPF System; and

(b) additional options for management are made available,

then, *ipso facto*:

(c) that continuing approach should be interpreted as exposing an ongoing want of efficacy in the countermeasures that have been applied.

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[34] Respondent's submissions in chief [41]; TAL.100.157.0130 (Summary of WINPAQ data, 12 March 2021).
[35] The applicants have received a necessarily large volume of WINPAQ data on discovery by the respondent in the period since April 2020 and then in direct connection with the Court ordered reference process in this matter.
[36] For the reasons in the respondent's submissions in chief [45], [46] and [49], it is highly unlikely that the few vehicles that had DPF-related reimbursement claims following implementation of the 2020 Field Fix experienced ongoing or further Vehicle Defects and/or Vehicle Defect Consequences.
[37] See for example TAL.100.125.0004 (Meeting Minutes - GD Engine, White Smoke, P2463 Post MY18 GR3 Schedule Discussion, 21 April 2020), TAL.100.152.0009 (Meeting Minutes - GD Engine, White Smoke, P2463 (GR Follow Up Meeting), 2 July 2020), TAL.100.132.0072 (Meeting Minutes - GD Engine, White Smoke, POST CSC Oct 18' - POST MY18 Tech Change (GR Follow Up), 20 February 2020), TAL.100.144.0215 (Converter Assy - White Smoke - P2463 - In Field Countermeasure Trial (Au-CQE x VED x TICO), 3 July 2020).

36. This logic does not reflect, and could not be the basis for, technological endeavour by Toyota or, the respondent submits, other original automotive equipment manufacturers in Japan, Europe and, as the Referee knows first-hand, the United States. Further enquiry and development, which is also known worldwide by a uniquely Japanese term of art - *kaizen*, is not, absent empirical evidence that has not been proffered by the applicants in this matter**,** any reflection of or concession as to any want of efficacy.

A E Munro
X Teo
CLAYTON UTZ

23 April 2021