(English Translation)

August 21, 2024

To whom it may concern,

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(Progress of Disclosed Matter)
Notice of Misconduct by a consolidated Subsidiary of the Company

IHI Corporation (hereafter "IHI") hereby announces with regard to an incident of misconduct in test operation records for marine engines and land-use engines (hereafter the "Matter") at its consolidated subsidiary IHI Power Systems Co., Ltd. announced on April 24, 2024, and June 4, 2024, that it has completed the confirmation of the facts in this incident and submitted the Investigation Report to the Ministry of Land, Infrastructure, Transport and Tourism today.

Regarding the Matter, a special investigation committee comprised of outside experts is conducting an independent investigation. The committee will continue to investigate the causes of the Matter and provide recommendations on the necessary recurrence prevention measures by September. We will take fundamental recurrence prevention measures based on the recommendations of this committee.

IHI would like to express its deepest apologies once again for the extreme inconvenience and concern caused by this misconduct to all of its stakeholders, including its customers and related institutions.

The impact of the Matter on IHI's operating results is currently being assessed, and any impact to be expected will be promptly announced.

(END)

Attachments
August 21, 2024 "Investigation Report"

August 21, 2024

Shipbuilding and Ship Machinery Division
Ocean Development and Environment Policy Division
Inspection and Measurement Division
Maritime Bureau
Ministry of Land, Infrastructure, Transport and Tourism

IHI Corporation
IHI Power Systems Co., Ltd.

Investigation Report

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1. Background and Scope of the Investigation

1.1 Background of the investigation

With the aim of improving its corporate culture, IHI Power Systems Co., Ltd. (IPS) has been conducting communication activities to allow employees to engage in discourse with the human resources department and top management. Following the communication activities carried out in late February 2024, an IPS employee reported that the "fuel consumption rates" provided to customers when engine products are shipped were altered using values different from those actually measured during test operations. Upon receiving the report, both IPS and its parent company IHI Corporation (IHI) conducted interviews with relevant personnel.

The interviews confirmed that the contents of the report were true, and that in the process of testing the engines manufactured at IPS and preparing the records, values differing from those actually measured during test operations were entered in the records (hereinafter referred to as "**misconduct**"). IHI and IPS accordingly formed a crisis management headquarters to investigate the records and conduct further interviews. On April 24, IHI reported the misconduct identified by April 23 to the relevant government ministries and agencies, additionally holding a press conference and disclosing the matter in a timely fashion. On June 4, IHI submitted an interim report to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

This report summarizes the investigation and the response taken since the Interim Report as well as the initiatives to prevent recurrence. There have been no confirmed cases of misconduct related to the safety of the engines during their manufacture and test operations. In addition, there have been no confirmed cases that may raise questions about the safety of the engines during actual use.

1.2 Scope of the investigation

The misconduct was confirmed to have occurred in the test operation processes carried out as part of the engine manufacturing process at the IPS plant. IPS possesses the four manufacturing bases of Niigata Engine Plant (Niigata City, Niigata), Ohta Plant (Ota City, Gunma), Niigata Gas Turbine Plant (Kitakanbara Gun, Niigata), and Niigata Foundry Plant (Niigata City, Niigata). Engines are manufactured at Niigata Engine Plant and Ohta Plant. The Niigata Gas Turbine Plant manufactures and tests gas turbines for the generation of electricity, while the Foundry Plant solely manufactures engine components.

The misconduct was confirmed to have occurred at Niigata Engine Plant and Ohta Plant where engines are manufactured. No misconduct has been confirmed at the Niigata Gas Turbine Plant or the Foundry Plant.

The misconduct was committed during the measurement of fuel consumption rates conducted as part of engine test operations at the plants. There are two fuel consumption rate measurements, each of which is measured separately.

(1) Measurements carried out when verifying NOx emissions (hereinafter referred to as "**NOx emissions verification**,"[*1] because measured fuel consumption rates are used as the basis for calculating NOx emissions) for the purpose of obtaining Engine International Air Pollution Prevention (**EIAPP**) certificates.

(2) Measurements carried out when delivering engines to customers (hereinafter referred to as "**pre-shipment test operations**") in order to confirm whether engine performance meets the specifications, including fuel consumption rates.

The scope of the investigation related to this case of misconduct covers both the NOx emissions verification and pre-shipment test operations conducted at both Niigata Engine Plant and Ohta Plant. In addition, investigations were carried out in relation to laws and regulations that may have been affected by the misconduct that was confirmed by the investigation.

*1 Regarding NOx emissions regulations:
NOx regulations for ship engines are based on MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships) as adopted by the International Maritime Organization, and have been passed into Japanese law under the Act on Prevention of Marine Pollution and Maritime Disaster.

According to the applicable regulations, certificates are issued to engines that have been inspected for NOx emissions and approved according to the EIAPP manual.
If the NOx emissions verification is performed on a prototype engine (hereinafter referred to as “parent engines”), subsequently manufactured engines of the same type and power band (hereinafter referred to as “member engines”) will be deemed to have the same NOx emissions values as the corresponding parent engine and be issued certificates accordingly. This handling is based on the NOx Technical Code regulations. When verifying NOx emissions, engine fuel consumption rates are used as one of the parameters to calculate NOx emissions. Tier I NOx regulations went into force in 2005 (for overseas ships, retroactively applied effective from 2000), followed by the Tier II regulations (a 20% reduction over Tier I) in 2011 and Tier III (an 80% reduction over Tier I, albeit in specified waters) in 2016.

2. On the investigation

2.1 Structure and development of the investigation

Following the report of this case of misconduct, IHI and IPS have conducted an investigation of the misconduct. A public announcement was made on April 24, with the investigation proceeded from the next day under the following structure.

- Head of the task force: IHI Senior Executive Officer in Charge of Company-Wide Quality
- Team responsible for investigating the causes and devising measures to prevent recurrence: composed of around 50 persons
- Customer response team: composed of around 50 persons
- Team for the investigation of records: composed of around 100 persons

The investigation and external public announcements developed as follows:

- Late February	- Misconduct reported
- March 1	- Content of the report shared with the IPS President
- March 5	- IPS internal investigation launched and report made to IHI
- March 7	- Results of IPS internal investigation reported to IHI - IHI crisis management headquarters established, with IHI Managing Executive Officer and President of Resources, Energy and Environment Business Area as the head of the task force. Investigation launched under the leadership of the IHI General Manager of Quality Assurance for the Resources, Energy and Environment Business Area, the IPS President, and the IPS General Manager of Quality & Environment Issues Dept. - Members of the investigation team selected for IHI to carry out interviews of IPS personnel. Team member selection focused on managers engaged with quality assurance in the IHI Resources, Energy and Environment Business Area. The technical advisor also participated in the case as a technical expert. In addition, a full-scale investigation was launched of engine test operation records at IPS Niigata Engine Plant and Ohta Plant.
- April 11	- The investigation revealed the severity of the situation, so the structure was strengthened, with the IHI Senior Executive Officer in Charge of Company-Wide Quality selected as the head of the task force.
- April 24	- Misconduct reported to the relevant government ministries and agencies. - Timely disclosure carried out and press conference held.
- June 4	- Interim Report submitted to the MLIT Maritime Bureau.
- August 21	- Investigation Report submitted to the MLIT Maritime Bureau.

2.2 Investigation method

2.2.1 Investigation of records

2.2.1.1 Investigation of compliance with NOx regulations

An investigation was conducted for all engines subject to NOx regulations. At Niigata Engine Plant, NOx emissions verification was carried out on parent engines 296 times (231

times for domestic engines, 65 times for overseas engines) for 1,193 member engines (689 domestic engines, 504 overseas engines) to confirm compliance with NOx regulations. At Ohta Plant, NOx emissions verification was carried out on parent engines 307 times (125 times for domestic engines, 182 times for overseas engines) for 3,875 member engines (1,291 domestic engines, 2,584 overseas engines) to confirm compliance with NOx regulations.

Fuel consumption rates are calculated and used during the process of verifying NOx emissions. Therefore, as part of this investigation, past records of NOx emissions verification were studied to see if there were any differences between the actually measured fuel consumption rate values recorded in IPS internal records (hereinafter referred to as the "**actual measured values**") and the "recorded values" of fuel consumption rates entered in the NOx emissions verification reports. In addition, it was confirmed whether the values measured concerning atmospheric temperature and atmospheric humidity, which are necessary for calculating NOx emissions, were altered. When there were differences in the actual measured values and recorded values, the NOx emissions were reevaluated by using the actual measured values to calculate the emissions.

2.2.1.2 Investigation of pre-shipment test operations

The procedure of pre-shipment test operations was as follows.

(1) Comparison of the actual measured values and the "recorded values" entered in the pre-shipment test operation reports provided to customers.

(2) Comparison of the actual measured values and the fuel consumption rate values entered in the specification documents provided to customers (hereinafter referred to as "**specification values**").

(3) Internal records include a history column where events that occurred during the pre-shipment test operations can be recorded. The contents of these history columns was therefore checked to confirm the presence of any misconduct besides the alteration of fuel consumption rates.

In addition, investigations were carried out with respect to the Ship Safety Act for marine engines, the EEDI[*2]/EEXI[*3] applicable to passenger and cargo vessels engaged in international voyage, and the Air Pollution Control Act for land-use engines. No engines deviated from the standards of fuel consumption rates prescribed by the Fishing Boat Act concerning fishing vessel engines.

*2 Energy Efficiency Design Index: An international index used to evaluate and compare the energy efficiency of maritime vessels that applies, in principle, to all internationally sailing ships of 400 GT or more. It has become a standard used to reduce the CO_2 emissions of vessels and lower their environmental burden.

*3 Energy Efficiency Existing Ship Index: An index applied to certain designated internationally sailing ships of 400 GT or more that is used to evaluate and compare the energy efficiency of existing maritime vessels.

2.2.2 Interviews

Interviews focused on technical experts, human resources departments, and quality assurance departments at IHI, involving not only people with experience of IPS engine test operations, but also related departments, officers, and employees.

The methodologies of the interviews concerning NOx emissions verification and pre-shipment test operations were as follows.

1) NOx emissions verification

All engine test operators and personnel with experience of engine test operations (16 subjects at Niigata Engine Plant, 15 subjects at Ohta Plant) were interviewed to confirm whether fuel consumption rates had been altered during NOx emissions verification, whether any equipment had been used improperly, whether records that entered the actual measured values were kept, and what could have motivated the misconduct.

2) Pre-shipment test operations
All engine test operators and personnel with experience of engine test operations (16 subjects at Niigata Engine Plant, 15 subjects at Ohta Plant), as well as 60 subjects involved in a broad range of other areas such as sales, development, design, quality control, and quality assurance, were interviewed to confirm whether fuel consumption rates had been altered during NOx emissions verification, whether any equipment had been used improperly, whether records that entered the actual measured values were kept, what could have motivated the misconduct, and whether there was any awareness of misconduct occurring outside the manufacturing and quality control departments.

3. The facts as revealed by the investigation results

3.1 NOx emissions verification

When NOx emissions verification was carried out at Niigata Engine Plant, the actual measured values of fuel consumption rates were written down on forms used for keeping internal records. If these figures satisfied the specification values, the actual measured values were entered into computers. However, it was confirmed that in some cases, when the figures did not satisfy the specification values, the actual measured values were altered.

The main model used at Niigata Engine Plant was a low-speed engine. The specification values for this engine were strictly set, so there were cases where the specification values of fuel consumption rates were exceeded in order to satisfy the NOx regulation values. Interview respondents testified that with this background, there was a concern that the fuel consumption rates at the time of NOx emissions verification would become known to customers, and customers would then compare the differences with the fuel consumption rates of the pre-shipment test operations submitted at the time of shipment. The fuel consumption rates were therefore altered to avoid discrepancies. In addition, we also found out that it was not only the fuel consumption rates, but that some records were altered for the values measured concerning atmospheric temperature and atmospheric humidity, which have an impact on the calculations of NOx emissions.

At Ohta Plant, on the other hand, no alteration of fuel consumption rates or values measured concerning atmospheric temperature and atmospheric humidity during NOx emissions verification was confirmed. The reason for this is thought to be that the main model used at Ohta Plant was a medium-speed engine that would not exceed the specification values of fuel consumption rates, even when operated in accordance with NOx regulation values. As a result, the motivation for the misconduct was absent. This finding was corroborated by interview testimony.

The alteration of fuel consumption rates when verifying NOx emissions is therefore thought to have occurred only at Niigata Engine Plant.

Tables 3-1 and 3-2 show the results of the NOx emissions verification investigation. The investigation results have been divided into the following four categories.

- Category A: No alteration of actual measured values could be confirmed, and there was no deviation from the NOx regulation values.
- Category B: Alteration of actual measured values was confirmed, but when NOx emissions were calculated using the actual measured values as written on internal records, there was no deviation from the NOx regulation values.
- Category C: Alteration of actual measured values was confirmed, and when NOx emissions were calculated using the actual measured values as written on internal records, there were deviations from the NOx regulation values.
- Category D: The actual measured values for the fuel consumption rates that should be used in the calculations when confirming the NOx emissions could not be identified.

Note that the values measured concerning atmospheric temperature and atmospheric humidity, are needed when converting measured concentration (ppm) to emissions (g/kWh) at the time of NOx emissions verification. These measured values were altered, an act motivated by a desire to show a narrow variation in each load operation. This alteration was verified 60 times and the

difference in the NOx emissions through such alteration was 1.3% at average, with a maximum of 5.9%.

Of parent engines at Niigata Engine Plant for which the actual measured values could not be confirmed at the time of submission of the Interim Report (Category D), with regard to those for which the actual measured values for the fuel consumption rates in the NOx emissions verification were newly found or for which alteration of values measured concerning atmospheric temperature and atmospheric humidity was confirmed during the continued investigation since the submission of the Interim Report, the NOx emissions were recalculated using the actual measured values prior to alteration and the categories were revised.

The categories for the number of member engines were also revised in conjunction with the revision of the categories for the parent engines. As of the time the Interim Report was submitted, the engines subject to the investigation were limited to those for which certificates had been issued since 2003. However, as a result of extending the scope of the investigation back to 2000 when the NOx regulations for overseas ships started to be applied, there were member engines (51 engines) for which certificates were issued during that period and those engines were added and categorized. In addition, the number of units per plant was revised where the plant subject to inspection for NOx emissions verification differs from the manufacturing plant of member engines.

As a result, for marine engines for domestic use, alteration of actual measured values to recorded values was found in 157 cases for parent engines (584 member engines belonging to these parent engines) (Category B and Category C). For marine engines for overseas, alteration of actual measured values to recorded values was found in 56 cases for parent engines (480 member engines belonging to these parent engines) (Category B and Category C). Of these, regarding engines with deviations from the NOx regulation values (Category C), for marine engines for domestic use, there were 9 cases for parent engines and 6 member engines, and for marine engines for overseas, there was 1 case for parent engines and 4 member engines. (Since the Interim Report was submitted, 8 cases for parent engines and 6 member engines were newly separated into Category C). In addition, regarding engines in cases where the actual measured values that are used when confirming the NOx emissions could not be identified, for marine engines for domestic use, there were 16 cases for parent engines and 19 member engines, and for marine engines for overseas, there were 0 cases for parent engines and 4 member engines, and these were separated into Category D.

Table 3-1 NOx Emissions Verification Survey Results (Marine Engines for Domestic Use)

Plant	Category	Number of parent engines (Number of NOx emissions verification)	Number of member engines[*4, *5] (Number of units shipped)
Ohta Plant	A	125	1,291[*5]
Niigata Engine Plant	A	58	86
	B	148	578[*5]
	C	9	6
	D	16	19
Total		356	1,980

Table 3-2 NOx Emissions Verification Survey Results (Marine Engines for Overseas)

Plant	Category	Number of parent engines (Number of NOx emissions verification)	Number of member engines[*4] (Number of units shipped)
Ohta Plant	A	182	2,584[*5]
Niigata Engine Plant	A	9	20[*5]
	B	55	476[*5]
	C	1	4
	D	0	4
Total		247	3,088

*4 The number of engines used for NOx emissions verification is included in the number of member engines.

*5 This includes member engines manufactured at a different plant, utilizing the NOx emissions verification results for the inspected plants.

According to interviews with all employees who have experience confirming the NOx emissions, the employees testified that, when confirming the NOx emissions, there were no improper alterations, such as using bypass lines or manipulating digital fuel flow meters and other alteration as confirmed in the pre-shipment test operations described below in Section 3.2.

(Reference: Results of survey released in the Interim Report on June 4)

- NOx Emissions Verification Survey Results (Marine Engines for Domestic Use)

Plant	Category	Number of parent engines (Number of NOx emissions verification)	Number of member engines (Number of units shipped)
Ohta Plant	A	125	1,324
Niigata Engine Plant	A	51	140
	B	89	242
	C	1	0
	D	90	226
Total		356	1,932

- NOx Emissions Verification Survey Results (Marine Engines for Overseas)

Plant	Category	Number of parent engines (Number of NOx emissions verification)	Number of member engines (Number of units shipped)
Ohta Plant	A	182	2,865
Niigata Engine Plant	A	4	3
	B	26	157
	C	1	4
	D	34	56
Total		247	3,085

3.2 Pre-shipment test operations

Table 3-3 shows the results of pre-shipment test operations (since 2003) survey. Of the 1,973 units shipped for domestic ship engines, 1,691 units were confirmed to have made misconduct and 572 units were found to have deviated from the specification values. Most of the misconducts were alterations of actual measured values of fuel consumption rates[*6]. It is believed that one of the motivations was to avoid explaining discrepancies to customers, based on the testimony that the alteration was performed not only when the actual measured values did not satisfy the specification values, but also when the fuel consumption rate data differed from that of the same engine previously delivered to customers, among other cases.

Meanwhile, at Niigata Engine Plant, (1) alterations using bypass lines to make the fuel consumption rate appear lower[*7] and (2) alterations manipulating digital fuel flow meters to make the fuel consumption rate appear lower[*8] were confirmed for 52 cases in total. It is believed that these alterations were made in order to avoid the exposure of the act of altering the actual measured values during the pre-shipment test operations when the customer attended and carefully observed the measurement items.

*6 As something that could impact the fuel consumption rates, there was alteration of secondary cooling water temperature among a few other cases of misconduct. As a result of evaluating the impact of these alterations, we verified that there was a minor impact on fuel consumption rates, and no impact on the evaluation results.

*7 Alterations using bypass lines to make the fuel consumption rate appear lower during pre-shipment test operations: (three cases confirmed)
Alterations during pre-shipment test operations at Niigata Engine Plant, fuel should flow from the fuel supply system with a fuel flow meter installed, but the bypass line valve set up for maintenance purposes was opened to make the fuel bypass the flow meter, which made the displayed fuel flow rate appear lower than the actual fuel flow rate. In Table 3-3, all three cases were recorded as “Number of units subject to misconduct” and “Number of

units deviating from specification values."

*8 Alterations manipulating digital fuel flow meters to make the fuel consumption rate appear lower during pre-shipment test operations: (49 cases confirmed)
During pre-shipment test operations at Niigata Engine Plant, the meter coefficient of the digital fuel flow meter was improperly altered, making the displayed fuel flow rate appear lower than the actual fuel flow rate. Of these, we were able to verify the actual fuel flow rate from the details of the alteration of the meter coefficient for 37 cases, and evaluated the deviation from specification values using the actual fuel flow rate. Engines for which we were unable to verify the actual fuel flow rate were recorded in "Number of units subject to misconduct" and "Number of units deviating from specification values" in Table 3-3.

As a result of reflecting on the survey results since the Interim Report on June 4 together with an awareness of customers, etc., we changed the number of units subject to this misconduct covered and the number of units deviating from specification values.

Table 3-3 Number of Misconducts in Pre-Shipment Test Operations Since 2003

Product Category	Destination	Number of units shipped	Number of units subject to misconduct*9	Number of units deviating from specification values*10
Marine engines	Japan	1,973	1,691	572
	Overseas	3,360	3,064	1,368
	Subtotal	5,333	4,755	1,940
Land use engines	Japan	1,168	128	7
	Overseas	66	35	5
	Subtotal	1,234	163	12
Total		6,567	4,918	1,952

*9 Number of engines with different actual measured values and recorded values.

*10 Number of engines for which actual measured values were found to have deviated from the specification values provided to customers. The degree of deviation from specification values is an average of 1.7%, with a maximum of 19.4% for marine engines, and an average of 2.6% with a maximum of 10.2% for land-use engines. The averages were calculated for the engines that deviated from the specification values (marine engines: 1,940 units, land-use engines: 12 units).

(Reference: Results of survey released in the Interim Report on June 4)
Number of Misconducts in Pre-Shipment Test Operations Since 2003

Product Category	Destination	Number of units shipped	Number of units subject to misconduct	Number of units deviating from specification values
Marine engines	Japan	1,973	1,689	621
	Overseas	3,360	3,062	1,329
	Subtotal	5,333	4,751	1,950
Land use engines	Japan	1,168	119	7
	Overseas	66	35	5
	Subtotal	1,234	154	12
Total		6,567	4,905	1,962

Table 3-4 shows the results of pre-shipment test operations survey (prior to 2002). For investigations of engines prior to 2002, this covered 2,754 of the total of 11,313 engines shipped for which pre-shipment test operation records could be verified from documents remaining within IPS. Investigation

was conducted on the number of units subject to misconduct and the number of units deviating from specification values. Verified records were for shipments in December 1974 for the oldest engine. Of the 663 marine engines for domestic use for which records could be verified, 552 engines were found to have been subject to misconduct and 98 engines were found to have deviated from the specification values.

Table 3-4 Number of Misconducts in Pre-Shipment Test Operations Prior to 2002

Product Category	Destination	Number of engines for which records were verified *11	Number of units subject to misconduct*12	Number of units deviating from specification values*13
Marine engines	Japan	663	552	98
	Overseas	1,373	1,061	114
	Subtotal	2,036	1,613	212
Land use engines	Japan	339	68	14
	Overseas	379	232	107
	Subtotal	718	300	121
Total		2,754	1,913	333

*11 Number of engines for which records were verified in the investigation records (shipped from December 1974)
*12 Number of engines with different actual measured values and recorded values.
*13 Number of engines for which actual measured values were found to have deviated from the specification values provided to customers. The degree of deviation from specification values is an average of 3.3%, with a maximum of 27.0% for marine engines, and an average of 1.3% with a maximum of 7.5% for land-use engines. The averages were calculated for the engines that deviated from the specification values (marine engines: 212 units, land-use engines: 121 units).

3.3 Impact on other regulations, etc.

Compliance with the following laws and regulations was also confirmed.

① About the Ship Safety Act for marine engines

No violations of regulations on engine safety under the Ship Safety Act have been identified.

② Response to EEDI/EEXI applicable to passenger and cargo vessels engaged in international voyage

As a result of investigating engines installed on ocean-going ships under domestic classification, although there were no EEDI cases and one EEXI case (which was a Japanese-flagged ship at the time of shipment but is now a foreign-flagged ship) was confirmed, it was confirmed that the fuel consumption rates measured by IPS were not used, and therefore it was not affected by these misconducts.

③ Air Pollution Control Act for land-use engines

The misconducts did not affect the measurement of the amount and concentration of soot and smoke, and there were no land-use engines in violation of the Air Pollution Control Act. In addition, compliance with the Air Pollution Control Act for all land-use engines was confirmed based on measurements conducted by third-party inspection agencies, which confirmed that there were no violations.

No misconduct in either the NOx emissions verification or pre-shipment test operations has been verified for Ammonia Dual Fuel Engine 6L28ADF, developed by IPS, as Green Innovation Fund Projects of Japan's New Energy and Industrial Technology Development Organization (NEDO), commissioned in FY2021.

4. Future responses to NOx regulations

Since the Interim Report was submitted on June 4, we have confirmed the NOx emissions for engines that are subject to test operations at the plants, and while confirming compatibility with NOx regulation values, we have verified the measurement and recording work flow, which was corrected and improved in response to the case of misconduct, and confirmed the suitability of the recurrence prevention measures. Subsequently, the issuance of certificates from the Classification Society (ClassNK) resumed for newly manufactured member engines using the certificates of parent engines for which no misconduct was verified in the NOx emissions verification (Category A shown in Section 3.1).

For parent engines that had not used actual measured values in the NOx emissions verification but were verified as satisfying the NOx regulation values through recalculation using the actual measured values (Category B), such engines to be manufactured in the future will be subject to NOx emissions verification and become new parent engines after being verified as satisfying NOx regulation values. In addition, we will proceed with alterations to appropriate figures using the actual measured values to deal with already issued certificates for ships under navigation while carefully explaining the information to customers.

As shown in Section 3.1, the investigation results concerning compatibility with NOx regulation values indicated verification of engines that do not satisfy the regulations in the NOx emissions verification (Category C). It was verified that 10 of these engines have been installed on ships (6 for domestic use). The deviation from regulation values is about 1 to 2%. These engines need to satisfy NOx regulations. To reduce NOx emissions, adjustments such as the injection timing of the installed engines, modification of certain components and other measures can be used. Regarding the amounts of reducing NOx emissions that are possible through the engine adjustments, modifications, etc., we will proceed with an evaluation based on the results of performance verification tests of the same engines or engines of the same type conducted thus far and other factors. If necessary, we will manufacture the engines and conduct actual tests to verify the performance. Based on the verification results, we will quickly determine and implement measures to comply with the regulations through consultations with MLIT.

Engines for which the actual measured values of fuel consumption rates cannot be verified in the NOx emissions verification (Category D) are evaluated for compliance with NOx emissions regulations using a method that can be explained from a technical standpoint, and based on the result, the response will be determined through consultations with MLIT. Examples of the evaluation method are as follows.

① When records of fuel consumption rates obtained from a previously conducted performance test of the same engine[*14] or an engine of the same type[*15] under similar conditions as those used in the NOx emissions verification are available, evaluate the NOx emissions using the available recorded values for the fuel consumption rates

② When records of fuel consumption rates obtained from a previously conducted performance test of the same engine or an engine of the same type under similar conditions as those used in the NOx emissions verification are not available, use the results of the performance test and evaluate the NOx emissions after calculating the fuel consumption rates that would be obtained under similar conditions as those used in the NOx emissions verification while taking the correlation of various parameters and other factors into consideration

*14 Engine that is the same as the one used in the NOx emissions verification

*15 Engine that is the same type, but has a different serial number as the one used in the NOx emissions verification

5. Analysis of causes and measures to prevent recurrence

5.1 Specific causes for confirmed misconducts and measures to prevent recurrence

Based on the investigation results, the presumed specific causes and the status of efforts to prevent recurrence for the confirmed misconducts to date are described below.

（1） Response to altering actual measured values when recording those values during NOx emissions verification and pre-shipment test operations

(Cause 1) The operation inspector belonged to the manufacturing and assembly department, but there was not sufficient independence from manufacturing and assembly to inspection. In addition,

the quality control department staff responsible for verifying inspection records did not sufficiently verify them.

(Measure 1) The direct supervisor of the quality control department was present at the tests to confirm NOx emissions and pre-shipment test operations, and the direct supervisor himself checked and recorded the actual measured values. (This measure has already been started.)
In the future, we will ensure independence of tests and inspections and review personnel allocation to strengthen the quality control department, transferring the creation of pre-shipment test operation records to the quality control department, and separating it from the manufacturing department.

(Cause 2) The process of confirming records on-site and reflecting those records in the final plant test report was unclear, and it was not documented as a business process.

(Measure 2) We established regulations for the entire work flow from on-site record confirmation to the final plant test report for NOx emissions verification and pre-shipment test operations. In this work flow, we clarified the measurement procedures, verification methods, items to be checked by direct quality supervisors, record sheets, calculation sheet management methods, etc., and work management was conducted according to these methods. (This measure has already been started.)
In accordance with documented processes, we conducted NOx emissions verification at Niigata Engine Plant and Ohta Plant on a total of 13 times (11 times for domestic engines, 2 times for overseas engines), and verified that they satisfy regulation values. Similarly, we conducted pre-shipment test operations at both plants on a total of 29 engines (18 domestic engines, 11 overseas engines). (As of August 19)
Without being limited to the process used to confirm the subject records, we are confirming the overall business processes from development to manufacturing and inspection, and are introducing a mechanism to ensure record security, including digitization, and establishing regulations for this purpose.

(Cause 3) Measurement and recording of fuel consumption rates were conducted manually using an analog method, and the possibility of alteration could not be completely eliminated.

(Measure 3) We have introduced and implemented automated measuring equipment for the measurement and recording of fuel consumption rates during NOx emissions verification and pre-shipment test operations from August 5.

（2） Response to alterations using bypass lines to make the fuel consumption rate appear lower during pre-shipment test operations

(Cause) The operation method for the bypass line in the fuel oil supply line was unclear, and it could be easily manipulated.

(Measure) The bypass line installed in the fuel oil supply line used during the NOx emissions verification and pre-shipment test operations was removed and was implemented on May 28.

（3） Response to alterations manipulating digital fuel flow meters to make the fuel consumption rate appear lower during pre-shipment test operations

(Cause) The meter coefficient of the digital fuel flow meter used to measure the fuel consumption rates was easily adjustable.

(Measure) Digital fuel flow meters, which were calibrated and sealed by the manufacturer, were introduced in conjunction with the automation of fuel consumption rate measurement, and have been used since August 5. In addition, together with the use of the new flow meters, we revised the management standards for tests and inspections of equipment and set the calibration period, etc.

5.2 Issues related to compliance awareness and organizational culture

Based on the survey results up until now, it is believed that the misconducts that were confirmed had placed undue burdens on the on-site operation inspectors, and had been perpetrated over many years without improvement. In addition, similar improper alterations were carried out for many years at two different plants, and many people who were involved in the design, manufacture, etc. of the engines in

the past knew about such alterations. However, although this included people who are officers and employees, the company failed to recognize this and take corrective action.

Currently, it is believed that the following issues and background causes related to compliance awareness and organizational culture have led to this situation.

- ・An organizational culture that allows improper alterations to be passed on
- ・An organizational culture with a silo mentality that prioritizes the work of one's own department
- ・Lack of awareness of quality and compliance
  - Facile and incorrect justifications on the idea that it is acceptable if the quality records are slightly different from the facts as long as there are no safety issues
  - Disregard of specification values and test records provided to customers
- ・Avoidance of customer explanations
- ・Lack of understanding and education on laws, regulations, and rules
- ・Lack of communication between different levels and organizations
- ・Internal environment in which initiatives to strengthen quality compliance were not fully utilized

In addition, since 2019, although compliance activities have intensified within the IHI Group, many people who recognized the facts of this matter did not speak up because they knew it would cause a major problem if it was made public. Although the role of eliminating psychological barriers (awareness of compliance violations but inability to speak up) lies with management, this role had not been fulfilled. In addition, considering that multiple officers and employees knew about the facts of this matter, the problems within the organization and management were significant.

5.3 Toward fundamental recurrence prevention

Going forward, we will further investigate the cause of the problem and take fundamental recurrence prevention measures with the following approaches in mind based on the recommendations of the Special Investigation Committee.

(1) Introduction of a new mechanism and establishment of a system for conducting tests and inspections that do not cause misconducts
(2) Restructuring of overall business processes, including improvement of technical specification decision processes in the development department, and continuous review and improvement through mutual collaboration and cooperation between departments
(3) Thorough review of organizational culture and fostering of a new organizational culture
(4) Fundamental review and restructuring of the organization and personnel system to prevent recurrence

Under this policy, in addition to ensuring the properness of the recording process, such as by introducing automatic measurement equipment in the NOx emissions verification and the pre-shipment test operations, measures for sealing digital fuel flow meters and other appropriate measures taken to date, we are also engaged in other efforts, including correcting the overall business processes from development to manufacturing and inspections, establishing regulations, further promoting activities that facilitate dialogue and other activities to reform the organizational culture, conducting quality and compliance training for all IPS employees and reviewing the personnel in order to ensure independence of testing and inspections and strengthen the quality control departments.

In addition, the IHI Group will, while conducting a strict examination of the overall business processes of IPS and proceeding with a review based on that examination, conduct a group-wide investigation and examination to confirm whether there are other cases of misconduct, and will continue such inspections in the future.

6. Reporting to customers

The managers of the sales departments and branches of IHI and the sales departments, branches, and sales offices of IPS are the core for apologizing and explaining the investigation results and progress

of discussion with related institutions to the many stakeholders in commercial flows, and we continue sincere response to all related parties.

As of August 19, we have received 1,465 reactions from customers. The entire company is focused on initiatives necessary to minimize the impact on processes for customers who have been particularly impacted by the delayed issuance of certificates caused by the company's case of misconduct.

In addition, we are taking a sincere approach, and gradually providing customers with the investigation results related to engines for which the investigation of records has been completed while responding to questions and requests. We will continue to carefully explain matters including the corrective action in light of this incident and status of consideration to measures to prevent recurrence, and respond in a way that seeks the understanding of customers.

7. Reduction in scope of ISO certification and renouncement of authorization for place of manufacturing business

A special investigation by Bureau Veritas Japan Co., Ltd., an ISO9001[*16] certification body, was conducted following such case of misconduct. As a result, a notice was received on August 9 stating that it was decided to reduce the certification scope and cancel the "scope related to the manufacture of reciprocating internal combustion engines under the jurisdiction of Niigata Engine Plant and Ohta Plant" of IPS. We will work towards quick recovery of the certification scope.

In addition, after carefully considering that the basic response policy has been finalized following the completion of the confirmation of the facts in this incident and that the scope of the ISO9001 certification has been reduced, and given the seriousness of these matters, we will renounce today the authorization for place of manufacturing business[*17] from MLIT.

*16 International standards for quality management system

*17 The authorization received from MLIT based on the Ship Safety Act. Businesses that receive this authorization may omit a portion of the inspections concerning manufacturing work.

8. Investigation by the Special Investigation Committee

The Special Investigation Committee composed of the following outside experts was formed to investigate the misconducts, and the investigation began on May 1, 2024.

- Chairman: Hiroshi Kimeda, Nishimura & Asahi (Gaikokuho Kyodo Jigyo)
- Committee Member: Makoto Shimamoto, Part-time lecturer, Faculty of Science and Technology, MEIJO UNIVERSITY
- Committee Member: Mitsuhiro Umezu, Ph.D., President and CEO, Umezu Institute of Business Ethics

The investigation was supported by lawyers affiliated with Nishimura & Asahi (Gaikokuho Kyodo Jigyo)

The Special Investigation Committee, independent of IHI and IPS, is proceeding with an investigation centered on document analysis (IPS internal regulations, organizational charts, minutes, measurement record data, development processes, etc.), interviews with related parties within IPS (67 interviews completed as of August 19, 2024), interviews with former full-time IPS directors, and a questionnaire for all IPS employees. No differences with the contents of this report have arisen at this time.

The Special Investigation Committee will continue to investigate the causes of the misconducts and provide recommendations on the recurrence prevention measures required by September.

(END)