

—JCR Climate Transition Finance Framework Evaluation By Japan Credit Rating Agency, Ltd.—

Japan Credit Rating Agency, Ltd. (JCR) announces the following Climate Transition Bond Framework Evaluation.

## JCR Assigned Green 1 (T)(F) (Final Evaluation) to Transition Bond Framework of IHI Corporation

Issuer : IHI Corporation (Security code: 7013)  
Subject : IHI Corporation's Transition Bond Framework

### <Evaluation Results of Climate Transition Bond Framework>

Overall Evaluation	Green 1(T)(F)
Green/Transition Evaluation (Use of Proceeds)	gt1(F)
Management, Operation and Transparency Evaluation	m1(F)

### Chapter 1: Overview of Evaluations

#### [Company Profile]

IHI Corporation is a major domestic comprehensive heavy-industry manufacturer that expanded its business to include heavy machinery manufacturing, bridge building, plant construction, and aero-engine production, originating from Ishikawajima Shipyard, Japan's first modern shipyard founded in 1853. Ishikawajima Heavy Industries, which is the successor of the Ishikawajima Shipyard, merged with Harima Shipbuilding and Engineering in 1960 to become Ishikawajima-Harima Heavy Industries, and subsequently changed its name to IHI in 2007.

Based on its management philosophy of "Contribute to the development of society through technology," the IHI Group is pursuing initiatives aimed at contributing to the resolution of social issues, such as the increase in global energy demand, urbanization and industrialization, and the efficiency of movement and transportation, with its engineering capabilities, which are centered on manufacturing ("Monozukuri") technology.

Currently, IHI provides a variety of products and services in the four business areas of "Resources, Energy & Environment," "Social Infrastructure & Offshore Facilities," "Industrial Systems & General-Purpose Machinery," and "Aero Engine, Space & Defense."

#### [About "Project Change"]

In November 2020, IHI announced "Project Change" to respond to changes in the business climate in response to the expansion of the new Corona contagious disease in response to the period required for preparing for and transitioning to change. The Project Change calls for promoting three initiatives: "Air transportation systems," "Carbon solutions," and "Maintenance and disaster prevention and disaster mitigation."

In November 2021, IHI announced the "IHI Group's ESG Management." In this context, IHI announced the "IHI Carbon-Neutral 2050," which states "Our 2050 Ambition for a Carbon-Neutral Value Chain". IHI has announced that it will work to reduce not only greenhouse gases (Scope1, Scope2) discharged directly and indirectly through its business activities, but also greenhouse gases (Scope3) emitted upstream and downstream, such as manufactured goods.

IHI believes that the emission of Scope3, such as aircraft equipment such as engines and power generation machinery such as turbines, is large, and that promoting the reduction of Scope3 emissions will lead to the carbon neutrality of society, and is making efforts in conjunction with the reduction of Scope1, Scope2.

#### [Overview of Evaluation Targets]

The scope of this evaluation is the Transition Bond Framework established by IHI (this framework). In this framework, the IHI has provided the following activities to help reduce customer CO<sub>2</sub> and reduce Scope3 emissions: 1; To develop an electronics system to realize zero-emissions mobility, 2; Carbon Solution to Energy, Shipbuilding, Chemical and other parts of the system, 3; To provide a disaster-prevention integrated social solution with data linkage that enables the management of forests by protecting peatland fires, and 4; To introduce renewable energy, energy efficiency, and convert fuels in order to reduce Scope 1,2 emissions of the company.

JCR confirmed that all of the above uses of proceeds are in areas of focus as IHI seeks to transform its business to achieve carbon neutrality by 2050, and that none of these technologies are technology locked in to fossil fuels. Based on the above, JCR evaluates that this use of funds will greatly contribute to the IHI Group's medium-to long-term transition strategy.

#### [Appropriateness of Transition Strategy and Contribution of the Vessels]

JCR confirmed that this Framework has been properly established and disclosed (to be established) for all four elements required by the Climate Transition Finance Handbook ("CTFH") issued by the International Capital Markets Association ("ICMA") in December 2020 and Basic Guidelines on Climate Transition Finance issued by the Financial Services Agency, the Ministry of Economy, Trade and Industry, and the Ministry of the Environment.

#### [Management and Transparency of the Proceeds]

JCR confirmed that the standards for selecting the use of proceeds were appropriate for the Climate Transition Financing, which require to identify the use of proceeds, and that relevant departments and management of the company appropriately involved in the selection process. The allocation plan, tracking management system and reporting of the proceeds are properly planned. Based on the above, JCR evaluates that the management and operation system for financing under the Framework is appropriate and that transparency is ensured. Furthermore, regarding the organization's approach to the environment, management positioned environmental issues as a high priority issue, and at the presentation of result of second quarter FY 2021 held in November 2021, JCR confirmed that the IHI had established a system and concrete investment plans for realizing them, such as declaring carbon neutrality across the entire value chain by 2050. This indicates that the organization's approach to the environment is innovative and ambitious, and that the commitment of management is clear.

Based on the JCR Green Finance Evaluation Methods, JCR assigned "gt1 (F)" for the "Green/Transition Evaluation (Use of Proceeds)", "m1 (F)" for the "Management, Operation, and Transparency Evaluation." Consequently, JCR assigned "Green 1 (T) (F)" for the overall evaluation of the "JCR Climate Transition Finance Evaluation" for the Transition Bond Framework. Evaluation results are discussed in detail in the next chapter. The Framework is considered to meet the standards for items required by "Green Bond Principles<sup>1</sup>", "CTFH<sup>2</sup>", "Basic Guidelines on Climate Transition Finance<sup>3</sup>", and "Green Bond Guidelines<sup>4</sup>".

---

<sup>1</sup> ICMA (International Capital Market Association) Green Bond Principles 2021

<https://www.icmagroup.org/assets/documents/Sustainable-finance/2021-updates/Green-Bond-Principles-June-2021-140621.pdf>

<sup>2</sup> ICMA Climate Transition Finance Handbook

<https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/CTFH-December-2020-091220.pdf>

<sup>3</sup> Financial Services Agency, the Ministry of Economy, Trade and Industry, and the Ministry of the Environment's Basic Guidelines on Climate Transition Finance (May 2021)

<https://www.meti.go.jp/press/2021/05/20210507001/20210507001-1.pdf>

<sup>4</sup> Ministry of the Environment's Green Bond Guidelines 2020,

<https://www.env.go.jp/press/files/jp/113511.pdf>

## Chapter 2: Current Status of Target Projects in Each Evaluation Item and JCR Evaluation

### Evaluation Phase 1: Climate Transition Evaluation

Based on the current situation and JCR's evaluation, as detailed below, JCR assessed that 100% of The Use of Proceeds under the Frameworks is for Green Project and/or Environmental Improvement Effect Project (climate transition project) to be implemented during the transition phase to mitigate climate change, and evaluation Phase 1: Climate Transition Evaluation at the highest level ("gt1(F)").

### 1. JCR's Key Consideration in this factor

#### Matters to be confirmed in this section

- ✓ Can the proceeds be used for Green Projects with clear environmental improvement effects and/or for projects with environmental improvement effects to be implemented at the transition stage (Climate Transition Projects)?
- ✓ When a negative impact on the environment is anticipated in the use of proceeds, whether the impact is sufficiently examined by a specialized internal department or an external third-party organization, and necessary avoidance and mitigation measures are taken?
- ✓ Does the issuers meet the four elements prescribed by ICMA's CTFH?
- ✓ Are there consistency of financial uses with the Sustainable Development Goals ("SDGs")?

### 2. Current Situation of Evaluation Subjects and JCR Evaluation

#### 2-1. Outline of Use of Proceeds

<Use of Proceeds defined in this framework>

	Criteria	Project	Summary
1	Electrification	Initiatives for Zero Emission Mobility	Promote the realization of environmentally friendly mobility through technological development and product development related to electrification and electrical systemization (Use of proceeds: Research and Development, Business Development, Capital Expenditure and miscellaneous cost relevant to above mentioned projects.)
2	Carbon Solutions	Initiatives for Ammonia Exclusive Firing and Establishment of an Ammonia Value Chain	Expanding the use of ammonia to realize early CO <sub>2</sub> reductions, and aiming to make power generation carbon neutral by developing green ammonia production technologies (Use of proceeds: Research and Development, Business Development, Capital Expenditure and miscellaneous cost relevant to above mentioned projects.)
		Realization of carbon recycling	Efficiently recycle carbon derived from non-fossil carbon sources, and aim to make fuel and raw materials carbon neutral by converting carbon into valuable resources, etc. (Use of proceeds: Research and Development, Business Development, Capital Expenditure cost and miscellaneous cost relevant to above mentioned projects.)

	Criteria	Project	Summary
		Demonstration of Small Modular Reactor Technology through International Collaboration	Aiming to promote the basis of safe and secure nuclear power as a power source without CO <sub>2</sub> for the elimination of CO <sub>2</sub> (Use of proceeds: Capital Contribution)
3	Integrated Social Solutions for Maintenance and disaster prevention mitigation	Building Regional Solutions Based on Data Collaboration	Realize a sustainable local community by providing solutions including H/W from data collection for the challenges faced by local communities in each region, such as disaster prevention, aging, and industrial development (Use of proceeds: Research and Development, Business Development and Capital Contribution)
4	Reducing CO <sub>2</sub> Emissions in Business Operations (SCOPE1,2)	Reducing CO <sub>2</sub> Emissions in Business Operations	Promote low-carbon production by switching to fuels for heat source equipment at business sites, promoting electrification, and upgrading to energy efficiency equipment. (Use of proceeds: Capital expenditure and miscellaneous cost relevant to the projects)

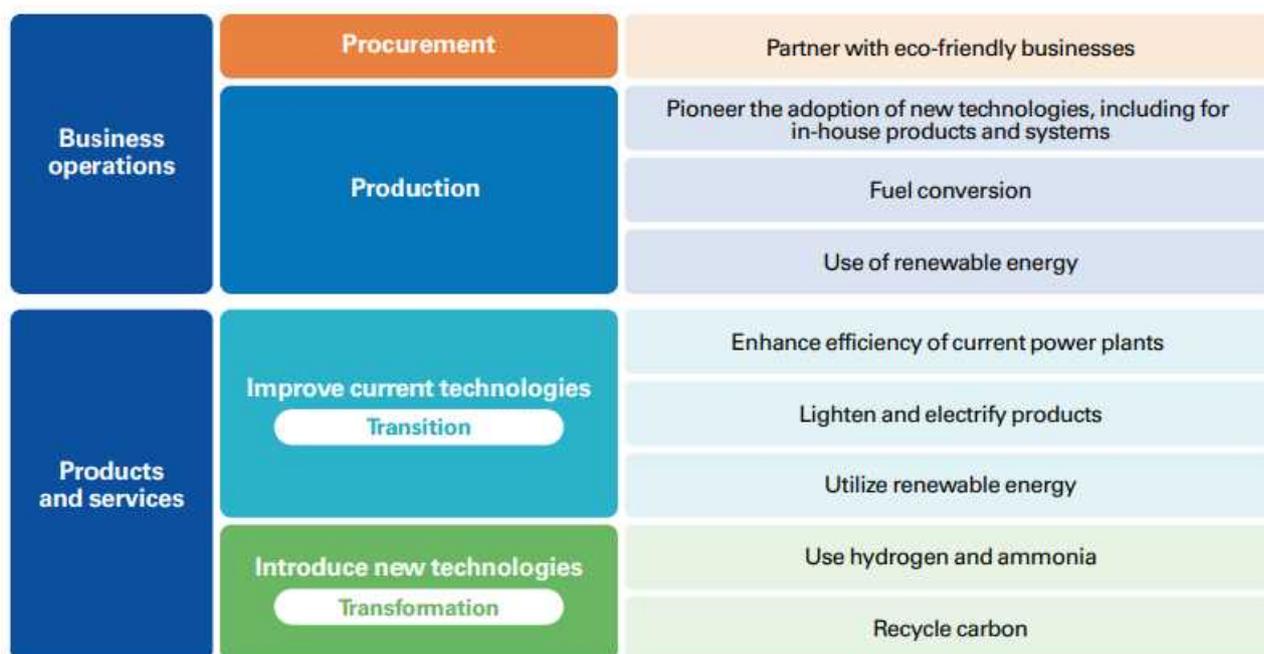
#### <JCR's Evaluation of the Framework>

The Use of Proceeds stipulated in this framework are all measures set forth by the IHI Group in the “Project Change”, which is equivalent to the Medium-Term Management Plan for the period from fiscal 2020 to fiscal 2022.

In November 2021, IHI set a long-term goal of achieving 2050 carbon neutrality across the entire value chain. Prior to the above target, IHI announced Scope 1, 2 milestones in line with the target set forth in the Japanese government's policy (46% reduction in FY2030 compared to FY2013). Regarding Scope3, although the interim reduction targets for the entire IHI Group have not been announced, at the Presentation on Business Activities held on May 17, 2019, the IHI Group announced "aiming to reduce 50% of CO<sub>2</sub> emissions of domestic and overseas customers by 2035" in the Resource, Energy, and Environmental Business area, which account for the majority of the IHI Group's CO<sub>2</sub> emissions. The use of proceeds in the Framework is targeted at businesses that contribute to CO<sub>2</sub> reductions efforts across the entire IHI value chain over the medium to long term.

IHI's CO<sub>2</sub> emissions by Scope indicate that Scope3 emissions are overwhelmingly greater than Scope1, 2. However, it is not necessarily appropriate to set a target in the form of a rate of reduction from total Scope3 emissions in recent years because CO<sub>2</sub> emissions in Scope3 are characterized by significant increases or decreases in emissions depending on the type of product delivered during the year, as customers range from mobility, energy, and environmental businesses. In light of this, IHI is currently formulating measures to reduce CO<sub>2</sub> not only in fiscal 2050, but also in fiscal 2030 for centering of its Resource, Energy, and Environmental business Area and Aero Engine, Space and Defense business Area. Of the uses of proceeds, 1 to 3 are measures to reduce Scope 3's CO<sub>2</sub> emissions. Subsequently, 4 is a measure to reduce CO<sub>2</sub> emissions in Scope 1,2. The target projects are also consistent with the Aircraft and Ship Transition Roadmap stipulated by the Ministry of Land, Infrastructure, Transport and Tourism, and the Electricity, Chemicals and Gas Roadmap presented by the Ministry of Economy, Trade and Industry. JCR is evaluating that not only IHI's own business activities, but also the provision of products and services will make a significant contribution to the transition strategies of multiple multi-emission fields.

Figure 1: Initiatives toward Carbon Neutral across IHI's 2050 Value Chain



(Source: IHI ESG STORY BOOK)

**Use of Proceeds Category 1: Electrification; Initiatives for Zero Emissions Mobility**

**This use of proceeds is the research and development and business development related to the electrification and electrical systemization of next generation aircraft and fuel cell vehicles, and is the cost for promoting the realization of environmentally friendly mobility. This use of proceeds fall under the "clean transportation" in the Green Bond Principles and "projects for clean transportation" among the uses of proceeds illustrated in the Ministry of the Environment's Green Bond Guidelines.**

IHI's products are used for various mobility such as aircraft, ships, and automobiles. R&D is in progress to reduce CO<sub>2</sub> of transportation (zero-emissions mobility). The following are examples of IHI's current efforts with respect to zero emission mobility.

- (1) Developing More Electric Architecture for Aircraft and Propulsion (MEAAP), such as air-cooling technologies for airplanes

The following is an example of IHI's innovation described in Challenge Zero<sup>5</sup>. Funds for R&D and capital expenditures related to the electrification of aircraft and aircraft engine systems are included in the use of funds in this framework.

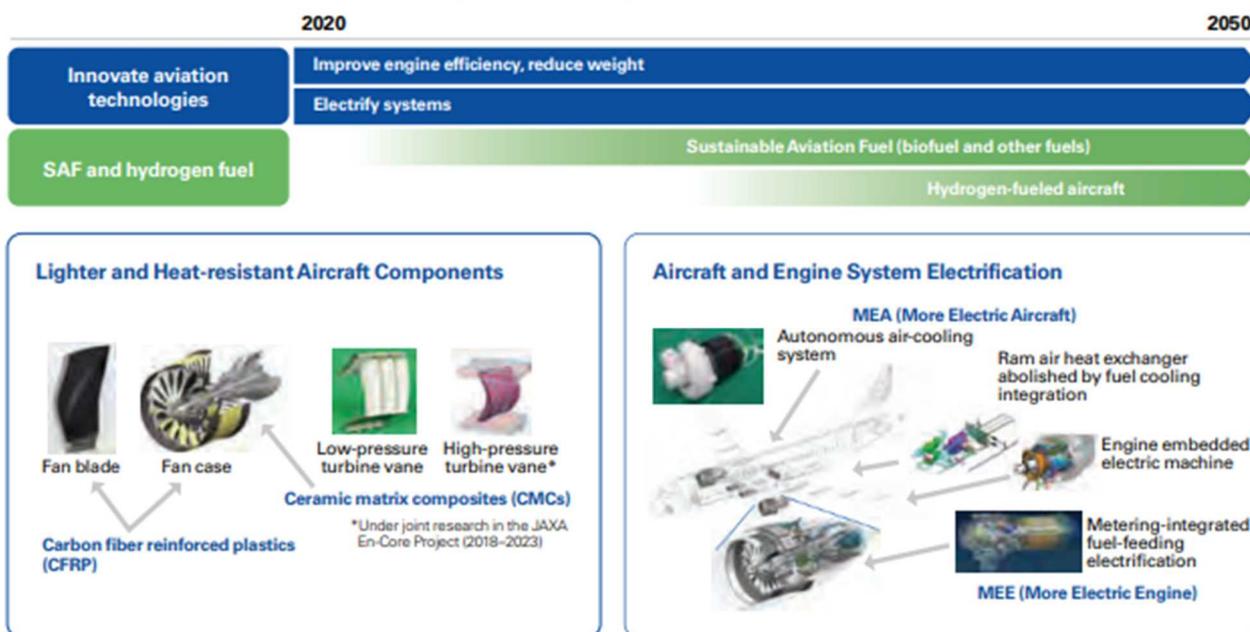
[Overview]

The International Air Transport Association. (IATA) has raised a 50% reduction in airline CO<sub>2</sub> emissions by 2050 compared to 2005.

The IHI Group aims to contribute to the achievement of IATA's CO<sub>2</sub> emission reduction targets through diversified challenges, including lightening aircraft engine components, electrifying aircraft and aircraft engines, development algae biofuels, and optimizing operations through digital Twins.

<sup>5</sup> "Challenge Zero-Carbon Innovation" is a new initiative in which the Japan Business Federation (Keidanren) collaborates with the Government of Japan to strongly disseminate and support both domestically and internationally the actions of corporates and organizations for innovation that they are taking on in order to realize a "carbon-free society," which is positioned as the long-term goal of the Paris Agreement, an international framework for combating climate change. Participating companies, etc. endorse Keidanren's "Challenge Zero" Declaration and announce specific innovation initiatives that each will take on challenges.

Figure 2: Roadmap toward Net Zero for Aircraft



(Source: IHI ESG STORYBOOK)

Figure 3: Process Chart for Promoting Decarbonization of Aircraft  
(Conference on Reducing CO<sub>2</sub> in the Aircraft Operation Field)

Please refer the website of Ministry of Land, Infrastructure, Transport and Tourism  
<https://www.mlit.go.jp/common/001445923.pdf> (Japanese)

[Goal]

Aircraft CO<sub>2</sub> emissions raised by IATA will be reduced by 50% in 2050 compared to 2005.

[Initiatives and Challenges]

This paper presents efforts to contribute to the goal of reducing CO<sub>2</sub> emissions and issues to be overcome.

1. Improving the efficiency and weight of aircraft engines

For aircraft engines, the application of parts using materials that are lighter and withstand higher temperatures is a problem in order to improve their fuel efficiency performance. Carbon fiber reinforced plastics (CFRP) have already been applied to large structural components, but in the future, IHI is working to apply them to fan blades for large rotating components that can make the most of the merits of this new material. And, regarding Ceramics matrix composites (CMCs) which is a new material of light weight and high heat resistance, it aims at practical application as soon as possible in cooperation with material manufacturers and domestic research institutes.

2. Electrification of aircraft and aircraft engines

Electrification of aircraft and aircraft engines not only improves fuel efficiency, but also eliminates the need for complex hydraulic systems, pneumatic systems, and mechanical mechanisms for energy

supply, which can improve design freedom, improve maintainability, and reduce weight. In order to realize the electrification of the aircraft, the method of loading the large capacity generator on the aircraft engine becomes a problem. In order to realize electrification of aircraft engines, feasibility of cooling and fuel system also becomes a problem. To solve these problems, the IHI Group is working on the development of electric motors with Engine embedded electric machine, Autonomous air-cooling systems, and Metering-integrated fuel-feeding electrification \*1.

\*1; A system that improves efficiency by optimizing fuel flow rate with an electric motor

### 3. Development of algae biofuels

The company aims to reduce CO<sub>2</sub> emissions by absorbing CO<sub>2</sub> when algae grows and using the oil it produces in the body to recover and refined fuel for aircraft.

Solar is used as an energy source necessary for Hyper-Growth Botryococcus Braunii, and an outdoor open pond cultivation method has been developed. Issues for commercialization are international certification of fuels and cost reduction, and at present, fuel certification acquisition of ASTM and upgrade of manufacturing process are proceeding.

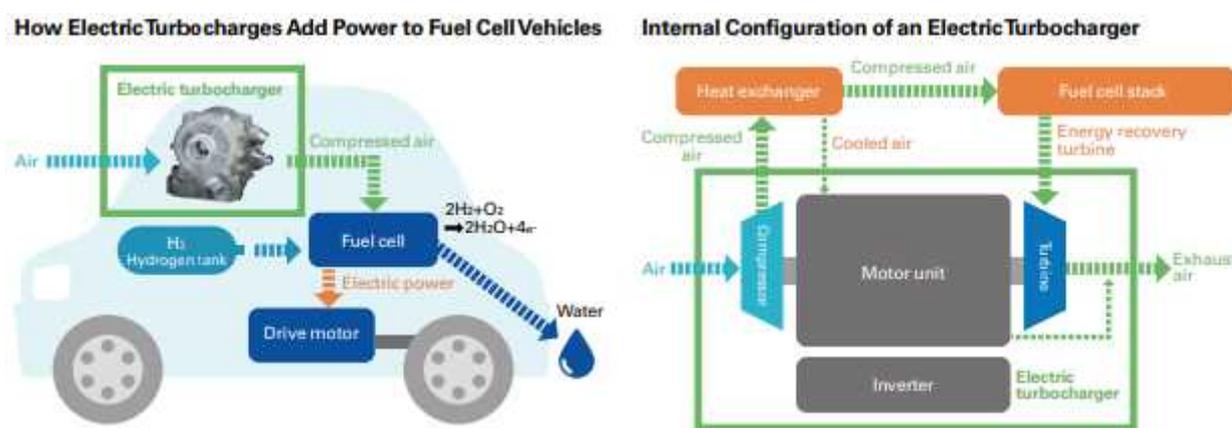
### 4. Optimization of Flight Operations with Digital Twin

Digital twin enables us to properly grasp and predict the conditions of aircraft engines from aircraft operation data, and to perform more effective operation and proper maintenance. Proper maintenance of airplanes will help to recover fuel efficiency and reduce CO<sub>2</sub> emissions.

#### (2) Electric Turbochargers(ETC) for Fuel Cell Systems

IHI's ETC is responsible for supplying oxygen (compressed air) to react with hydrogen in fuel cell systems such as those for hydrogen fuel cell vehicles (FCVs). IHI has developed air-turbochargers for fuel-cell systems for about 20 years, including those for FCV, stationary type, and has repeatedly commercialized them. In 2018, IHI was the first in the industry to commercialize ETC equipped with turbines for fuel-cell systems. These ETCs were installed in Daimler's Mercedes Benz GLC F-CELL.

Figure 4: Role of Electric Turbochargers in Fuel Cell Vehicles



(Source: IHI ESG STORY BOOK)

In April 2021, IHI entered into an ETC technical assistance agreement with AVL of Austria. AVL has been promoting a fuel cell-related business for about 20 years, and has a track record of many projects ranging from automobiles to stationary applications. In the future, through cooperation of the two companies, AVL aims to realize a more efficient fuel cell powertrain system by utilizing the knowledge and technology of fuel cell systems, powertrains, batteries, motors, etc. possessed by AVL and the knowledge and technology of turbochargers for vehicles including internal combustion engines and FCVs possessed by IHI. In this collaboration, IHI is planning to install ETCs under development in Hytruck fuel cell systems for commercial vehicles currently being developed by AVL, and is already supplying prototypes. Hytruck fuel-cell systems are modular platforms with 150kW power and are intended for commercial vehicles such as trucks and buses.

IHI's ETC solves the problem of poisoning by lubricating oil mist of catalysts used in fuel cells by realizing oil-free through the adoption of air bearings. And, by recovering exhaust gas from a fuel cell by a turbine, high efficiency of the system is realized, and it has two big features that it can contribute to miniaturization and weight reduction.

IHI is working on the development of the next generation ETC in order to develop the size and series according to the output of the fuel cell.<sup>6</sup>

---

## **Category 2: Carbon Solutions; Initiatives for Dedicated Ammonia Fire and Building an Ammonia Value Chain**

---

**This use of proceeds is used to expand the use of ammonia to realize early CO<sub>2</sub> reductions, as well as to fund R&D, business development and capital expenditures aimed at carbon neutralization of power generation through the development of green ammonia production technologies. This use of proceeds falls under "energy efficiency", "clean transportation" in the Green Bond Principles and "projects for energy efficiency", "projects for clean transportation" among the uses of proceeds illustrated in the Ministry of the Environment's Green Bond Guidelines.**

IHI is implementing developing power generation technology using ammonia, which is a next-generation fuel that contributes to climate change measures, and verification projects for the social implementation of domestically produced engine-equipped vessels with ammonia fuels which does not emit CO<sub>2</sub> when it burned. In addition, in the future, anticipating a society in which ammonia use is expanding, IHI aims to contribute to the construction of a value chain from the production to the use of ammonia.

Examples of R&D and verification projects corresponding to these uses of proceeds are as follows.

(1) Demonstration project of ammonia conglomeration at large-scale thermal power plants (20%, 50%)

This project is a project on the development and verification of ammonia blending rate improvement technology in coal boilers carried out jointly with JERA("JERA Co., Ltd., and has been adopted for two projects in NEDO Green Innovation Fund project/construction project of fuel ammonia supply chain.

1. Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation, etc.; Research, Development and Technologies for Ammonia Co-firing Thermal Power generation

---

<sup>6</sup> Source: IHI website, [https://www.ihi.co.jp/en/all\\_news/2021/industrial\\_general\\_machine/1197306\\_3364.html](https://www.ihi.co.jp/en/all_news/2021/industrial_general_machine/1197306_3364.html)

This project is a demonstration project aimed at establishing ammonia co-firing technology by evaluating the characteristics of heat absorption and exhaust gas of boilers by co-firing coal and ammonia in large commercial coal-fired power generators. The project period is scheduled to be approximately four years from June 2021 to March 2025.

This project aims to achieve an ammonium-mixed burning rate of 20% at Unit 4 of JERA's Hekinan Thermal Power Station (power generation capacity: 1 million kW). IHI is in charge of the development of verification burners. Incidentally, in order to ensure the mass co-firing of ammonia, small-scale co-firing tests of ammonia have been carried out at Unit 5 of Hekinan Thermal Power Station (power output: 1 million kW) using burners of different materials from August to December 2021 to confirm the necessary conditions for the development of a demonstration burner.<sup>7</sup>

## 2. Business on Development and Verification of Technologies for Improving Ammonia Combustion Rate in Coal Boilers

This project aims to develop a new ammonia highly-mixed firing burner, install the burner in Hekinan Thermal Power Station Unit 4 or Unit 5 in JERA, and expand the mixed firing rate of ammonia to more than 50%. The project period is scheduled to be approximately eight years from fiscal 2021 to fiscal 2028. By fiscal 2024, a burner capable of mixed combustion of ammonia of 50% or more will be newly developed, and specifications of boilers and other equipment will be examined. Based on the results, IHI will decide whether to implement this burner at the Hekinan Thermal Power Station. When implemented, it is planned that by fiscal 2028, 50% or more of ammonia mixed firing will be started in the actual machine.<sup>8</sup>

### (2) Development of liquid ammonia exclusive firing (100%)

IHI, together with Tohoku University and the National Institute of Advanced Industrial Science and Technology, has applied for and adopted a project for the R&D of liquid ammonia-only incinerated gas turbines for NEDO's "Green Innovation Fund Project/Project for Construction of Fuel Ammonia Supply Chain."

In this project, in order to reduce greenhouse gas emissions from gas turbine cogeneration systems, we will develop a technology for exclusive combustion of liquid ammonia (100%) in a 2MW class gas turbine, as well as acquire management know-how through demonstration tests and verification safety measures for early social implementation. In addition, feasibility studies will be conducted on the issues and applicability of ammonia use in the power generation business, and the degree of certainty of social implementation will be further increased. The project period is planned to be about seven years from fiscal 2021 to fiscal 2027.

The gas turbine, which burns liquid ammonia by spraying it directly into the combustor, has advantages for social implementation such as simplification and controllability improvement of the supply system from the storage tank to the gas turbine. On the other hand, since liquid ammonia is less combustible than natural gas or ammonia gas, stabilization of a flame and reduce of harmful substances in an exhaust gas become a problem in a liquid ammonia exclusive combustion. In the research and development of liquid ammonia only fuel gas turbines, the development of the burning technology which solves these problems will be carried out.<sup>9</sup>

<sup>7</sup> IHI News Release [https://www.ihico.jp/ihico/all\\_news/2021/resources\\_energy\\_environment/1197628\\_3345.html](https://www.ihico.jp/ihico/all_news/2021/resources_energy_environment/1197628_3345.html)

<sup>8</sup> IHI News Release [https://www.ihico.jp/ihico/all\\_news/2021/resources\\_energy\\_environment/1197627\\_3345.html](https://www.ihico.jp/ihico/all_news/2021/resources_energy_environment/1197627_3345.html)

<sup>9</sup> IHI News Release [https://www.ihico.jp/en/all\\_news/2020/resources\\_energy\\_environment/1197060\\_2032.html](https://www.ihico.jp/en/all_news/2020/resources_energy_environment/1197060_2032.html)

JCR evaluates that the projects described in (1) and (2) are consistent with the target setting for ammonia blending in the Power Roadmap indicated by the Ministry of Economy, Trade and Industry.

Figure 5: Transition Roadmap for the Electricity Sector

Please refer the website of Ministry of Economy, Trade and Industry

[https://www.meti.go.jp/policy/energy\\_environment/global\\_warming/transition/transition\\_finance\\_roadmap\\_electric\\_jpn.pdf](https://www.meti.go.jp/policy/energy_environment/global_warming/transition/transition_finance_roadmap_electric_jpn.pdf) (P22, Japanese)

### (3) Ammonia-fired marine engine development

This project is "development of vessels equipped with domestically produced ammonia fuel engines" conducted by IHI Power Systems Co., Ltd in collaboration with Nippon Yusen K.K., Japan Engine Corporation and Nihon Shipyard Co., Ltd., and has been adopted as a NEDO subsidy project which is part of the Green Innovation Fund project. By using ammonia as fuel, IHI will be able to significantly reduce emissions of greenhouse gases (Greenhouse Gas, hereinafter referred to as "GHGs") during navigation, aiming for a social implementation earlier than in 2030, and working toward the goal of achieving zero emissions for ships in the future.

Reduction of GHG emission has become an urgent issue in the marine transportation field, and research and development are advancing toward the popularization of next-generation zero-emission fuels such as hydrogen and ammonia, in addition to the conversion of marine fuel from conventional heavy oil to liquefied natural gas (LNG). Ammonia is expected to be a next-generation fuel that contributes to global warming countermeasures because it does not emit carbon dioxide (CO<sub>2</sub>) even when burned. Furthermore, by utilizing CO<sub>2</sub>-free hydrogen as a raw material for ammonia, it is said that it is possible to realize zero emission considering the life cycle of fuel.

In this project, the development and operation of ammonia fuel tugboats and the development and operation of ammonia fuel ammonia transport vessels will be adopted, and verification projects will be implemented with each subsidized by NEDO<sup>10</sup>.

#### 1. Develop and operate ammonia-fueled tugboats (A-Tug: Ammonia-fueled Tug Boat)

Since flame retardancy, which is hard to ignite, becomes a bottleneck for ammonia fuel, a small amount of fuel oil is assumed to be used as pilot fuel in this project. Aim to reduce GHG emissions by achieving an ammonia fuel bleaching rate of 80% or more, targeting service launches in fiscal 2024. In the future, with a view to achieving zero total GHG emissions by using biofuels as pilot fuel, IHI will work to improve the mixed burn rate and confirm stable operations through demonstration operations.

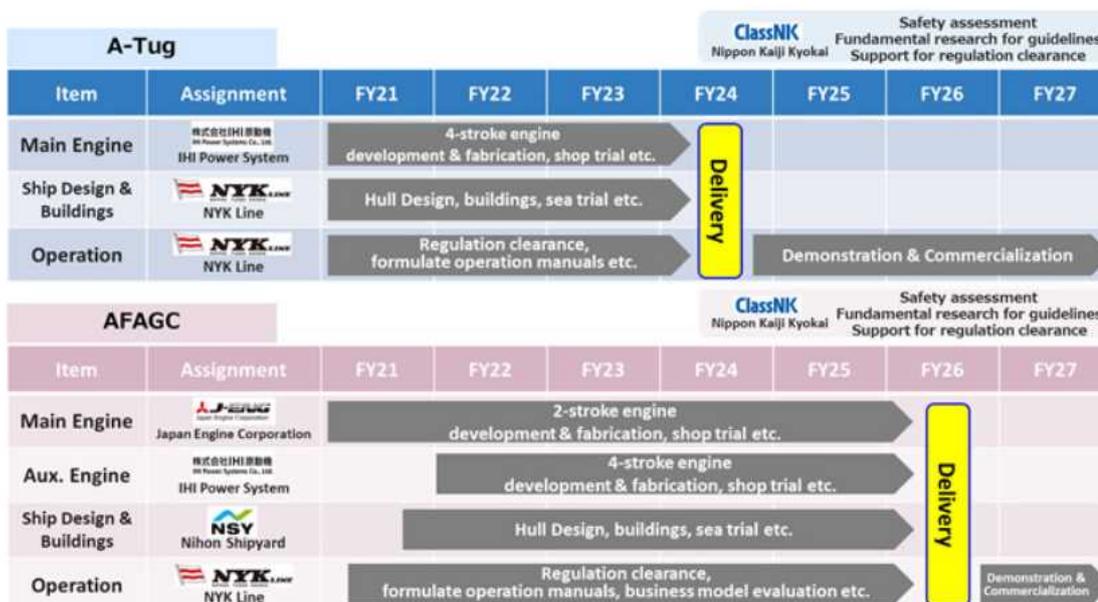
#### 2. Develops and operates ammonia-fueled ammonia gas carrier (AFAGC: Ammonia-fueled Ammonia Gas Carrier)

Targeting service in fiscal 2026, the company aims to develop and operate ammonia-fueled ammonia transport vessels under the concept of transporting ammonia as cargo and moving ammonia gas from that cargo and ammonia cargo as fuel during the voyage. Aim to reduce GHG emissions by achieving a blending ratio of ammonia fuel of up to 95% for the main engine that operates vessels and a blending ratio of ammonia fuel of more than 80% for the subsidiary that operates generators.

<sup>10</sup> IHI press release  
[https://www.ihi.co.jp/en/all\\_news/2021/resources\\_energy\\_environment/1197564\\_3360.html](https://www.ihi.co.jp/en/all_news/2021/resources_energy_environment/1197564_3360.html)

In the above two projects, IHI Power Systems will be in charge of the development of ammonia fueled four stroke engine.

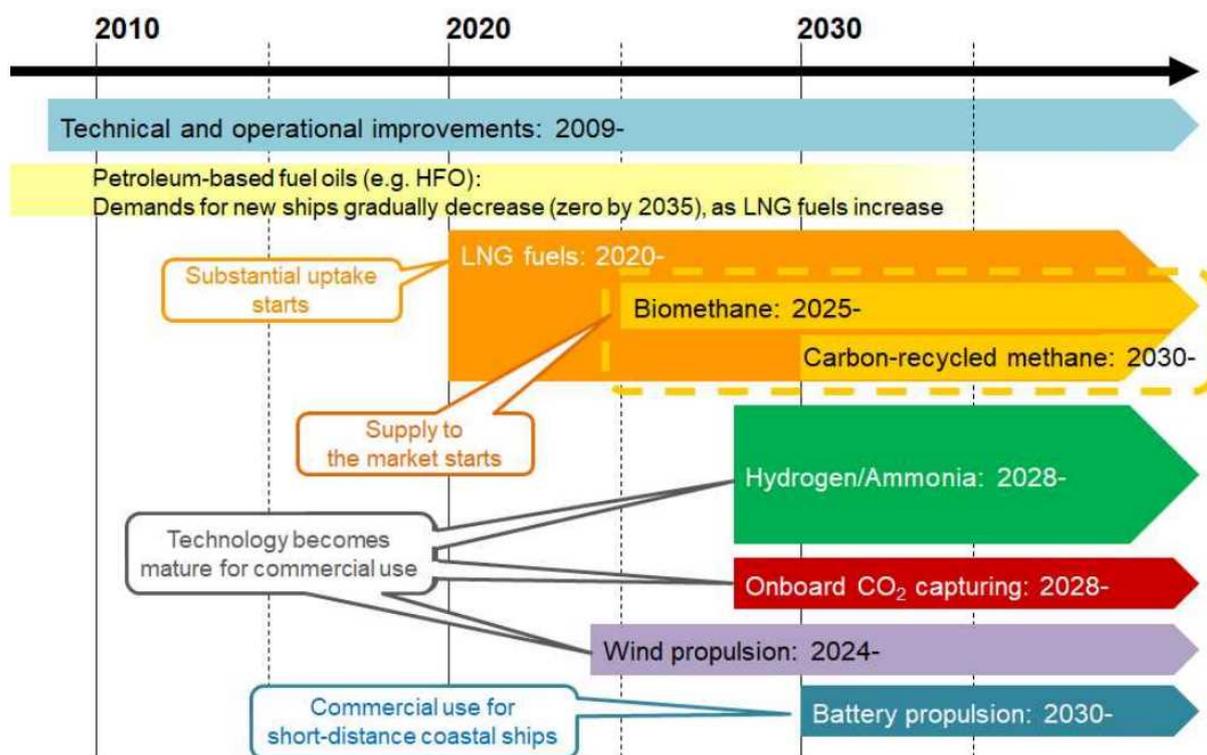
Figure 6: Roles of Participating Companies



(Source: IHI Press Release)

JCR evaluates this project to be consistent with the International Shipping Zero Emissions Roadmap as indicated by the Ministry of Land, Infrastructure, Transport and Tourism.

Figure 7: Assumptions about changes in the fuel used by ships



---

## Use of funds Category 2: Carbon recycling; Realization of carbon recycling

---

The purpose of this proceeds is the cost for research and development, business development and capital expenditure, including miscellaneous cost for efficiently circulating carbon derived from non-fossil carbon sources and aiming at carbon neutralization of fuel and raw materials by converting carbon into valuable resources, etc. This use of proceeds falls under "Circular economy adapted products, production technologies and processes and/or certified eco-efficient products" in the Green Bond Principles and "projects concerning eco-efficient products, production technologies, and processes" among the uses of proceeds illustrated in the Ministry of the Environment's Green Bond Guidelines.

In addition to reducing CO<sub>2</sub>, it is also crucial to consider ways to use and store CO<sub>2</sub> that cannot be reduced in order to achieve 2050 that is neutral. The "Green Growth Strategy Through Achieving Carbon Neutrality in 2050" formulated by the Ministry of Economy, Trade and Industry in collaboration with related ministries and agencies indicates a policy of using carbon recycling technology to capture carbon dioxide (CO<sub>2</sub>) emitted into the atmosphere as a resource, to separate and recover it, and to effectively utilize it as a key technology for realizing carbon neutrality.

IHI is currently working on the following businesses in relation to this use of proceeds.

- (1) Development of technologies for carbon recycling, next-generation thermal power generation, etc.; development of technologies for reduction and effective utilization of CO<sub>2</sub> emissions; research and development of low-grade olefin production technology using direct synthesis reaction using CO<sub>2</sub> as raw material

IHI has been selected by NEDO as a subcontractor for "Technological development of carbon recycling, next-generation thermal power generation, etc./Development of technologies for reducing and effectively use CO<sub>2</sub> emissions/R&D of low-grade olefin production technologies by direct synthetic reaction using CO<sub>2</sub> as a raw material" (hereafter, this research). This study aims to establish the basis of a process to produce low-grade olefins without using petroleum and to consider integration with an existing low-grade olefin manufacturing plant.<sup>11</sup>

Conventionally, low-grade olefins are produced by thermally decomposing naphtha derived from crude oil, but IHI aims to establish a technology for synthesizing CO<sub>2</sub> and hydrogen recovered from exhaust gas and air by reactors and catalysts. This is a carbon recycling technology that effectively utilizes CO<sub>2</sub> currently discharged, and it will be possible to reduce CO<sub>2</sub> emitted during the production of plastics, etc. To date, IHI has developed catalysts through joint research with the Institute of Chemical Engineering and Sciences (ICES) of the Singapore's Agency for Science, Technology and Research, and IHI has been confirmed in a laboratory test that it can produce olefins at good efficiency.<sup>12</sup>

In this research, IHI will develop a reactor that can efficiently and stably produce olefins by controlling heat generation in response, making use of the development of even higher performance catalysts based on the catalysts developed so far and the reactor design technology for petrochemical reactors. In addition, CO<sub>2</sub> recovery equipment and low-grade olefin production equipment are installed in the petrochemical plant site,

---

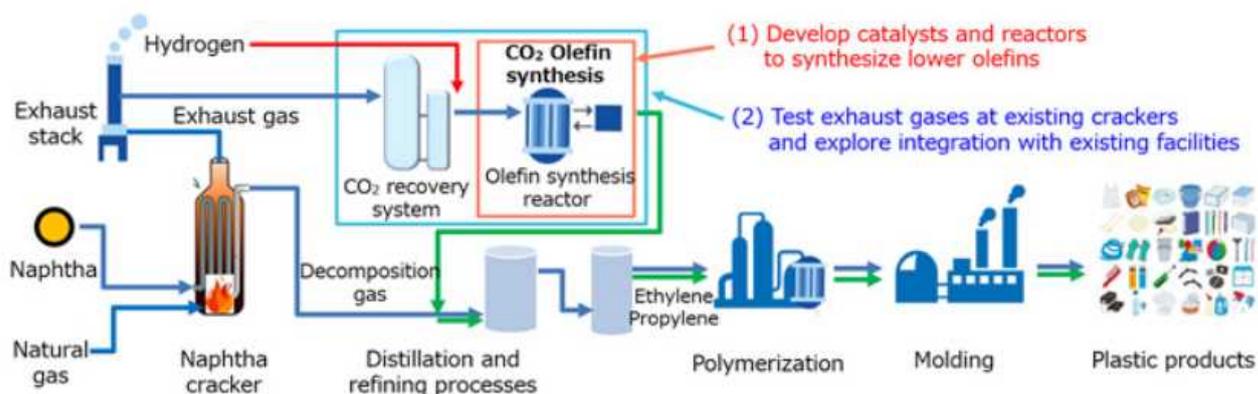
<sup>11</sup> Lower Olefins: Shows ethylene, propylene, butane, etc., which are raw materials for many major basic chemicals. It is used as a raw material for plastics and resins.

<sup>12</sup> Naphtha: A low boiling component obtained by the distillation of crude oil. It is used as a raw material for solvents and petrochemicals.

and the production test using CO<sub>2</sub> recovered from the actual emission gas and by-product hydrogen in the plant is planned to be carried out from fiscal 2024. The conditions for integration with existing plants will be examined by comparing and evaluating the compatibility of low-grade olefins obtained in the tests with low-grade olefins manufactured at existing plants. The research institutes are scheduled to be from fiscal 2021 to fiscal 2025.

IHI has already developed methanation catalysts and reactors and CO<sub>2</sub> recovery equipment, and it intends to promote this research with the aim of contributing to the realization of carbon neutrality in the chemical industry by utilizing the process design technology of the plant.<sup>13</sup>

Figure 8. Correlation between the Study Items (1, 2) of this Project and the Existing Value Chain



Project's two R&D themes and value chain leveraging existing facilities

(Source: IHI News Release)

## Use of Proceeds Category 2: Carbon Solutions; Demonstration of Small modular reactor technology through international collaboration

This funding is for investment in a U.S. company that conducts R&D and capital investment in small module reactors, which are regarded as highly safe, out of the reactors that are positioned domestically and internationally as decarbonized power sources. This use of proceeds falls under "Circular economy adapted products, production technologies and processes and/or certified eco-efficient products" in the Green Bond Principles and "projects concerning eco-efficient products, production technologies, and processes" among the uses of funds illustrated in the Ministry of the Environment's Green Bond Guidelines.

The small module reactor (SMR) is a nuclear reactor with enhanced safety by facilitating the cooling of the reactor by reducing the output per unit, unlike conventional nuclear power plants with an electric output of over 1,000 MWe. As defined by the International Atomic Energy Agency (IAEA), reactors with an electric power of 300 MWe or less will be SMRs. From the viewpoints of safety, factory productivity, flexibility in location, operation, and utilization, SMR is being actively developed and examined for introduction in each country, mainly in the U.S., Canada, the U.K., Russia, and China. In Japan as well, the "Green Growth Strategy Through Achieving Carbon Neutrality in 2050" indicates support for Japanese companies' efforts in collaboration with overseas SMR demonstration projects and support for technological development required for carbon-free hydrogen production using a high-temperature gas reactor, one of SMR's reactor types. The Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry are also carrying out the Nuclear Energy Innovation Promotion (NEXIP) initiative projects to support private enterprises that develop innovative nuclear technologies such as small

<sup>13</sup> IHI News Release [https://www.ihi.co.jp/ihi/all\\_news/2021/resources\\_energy\\_environment/1197583\\_3345.html](https://www.ihi.co.jp/ihi/all_news/2021/resources_energy_environment/1197583_3345.html)

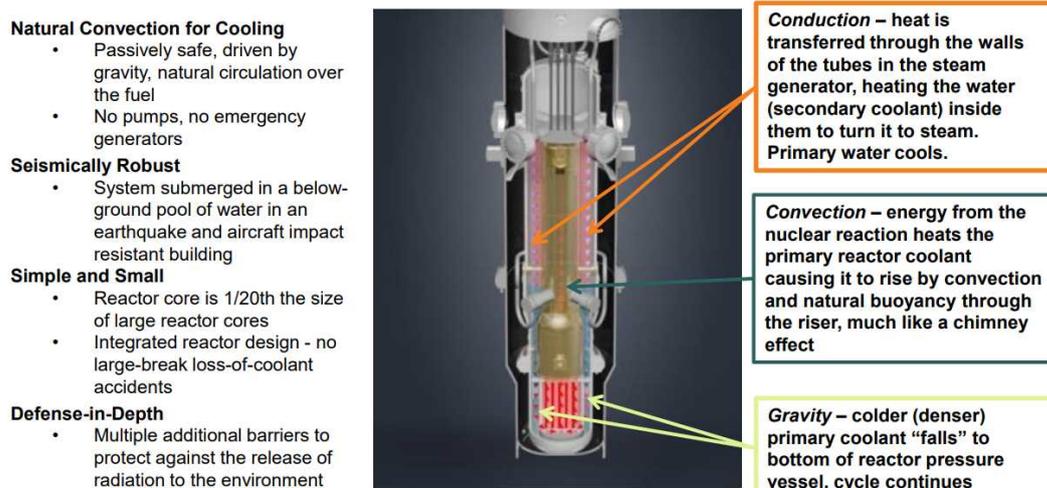
fast reactors, small light water reactors, and high-temperature gas reactors. The Japan Atomic Energy Agency (the Atomic Energy Agency) is also carrying out demonstration of the safety of high-temperature gas reactors centering on the test research reactor HTTR restarted in July 2021, technological development of thermal utilization (hydrogen production and gas turbine power generation), and technological development of small fast reactors.<sup>14</sup>

In the U.S., the development of SMR is promoted mainly by private enterprises, and the government supports the activity. The main SMR hereinafter plans in the U.S. are shown below. In the United States, light water reactors with an electric output of 300 MWe or less are designated as SMRs, while non-light water reactors are designated as "new-type reactors" regardless of their output.

U.S. NuScale Power is developing NuScale Power Module (NPMs), a SMR with a thermal output of 160 MWt and an electrical output of 50 MWe (now thermal output of 250 MWt and electrical output of 77 MWe through design improvements) based on PWR technology. In development, NuScale received Department of Energy (DOE) support, including USD 226 million in 2013. In 2029, the company aims to begin operation of NPMs, the first of its kind at NuScale Power, on the premises of the Idaho National Laboratory (INL). Its owner, the Utah Associated Municipal Power System (UAMPS), is planning to consolidate 12 NPMs to generate electricity (in July 2021, it changed to consolidate 6 units from the forecast of electricity consumption). This plan is called the Carbon Free Power Project (CFPP). In October 2020, UAMPS announced that the DOE had approved USD 1.355 billion in financial assistance to CFPP over a 10-year period. The design of NPM (electric output 50 MWe version) was issued by the U.S. Nuclear Regulatory Commission (NRC) on September 11, 2020, Standard Design Approval (SDA). As a result, the design became the first SMR design in the U.S. to meet all NRC safety and regulatory requirements. The company plans to apply for SDA certification for the 77 MWe electric output version in 2022. The NPM's unit price for leveled power generation (when six units are connected) is USD 58/MWh (JPY 6.4/kWh when converted to USD 1 = JPY 110). NuScale is working with Canadian, Romanian, Czech, Ukrainian, UK, Polish, Korean and Japanese companies and governmental bodies to expand NPMs global. IHI, together with JGC Holdings, decided to invest in NuScale in November 2021. The purpose of this fund is to invest newly in NuScale.

According to NuScale, the company's NPMs are becoming more secure in the following ways.

Figure 9:NPM Safety Features



**Steel containment has >10 times pressure rating of a typical PWR.**  
**Water volume to thermal power ratio is four times larger than typical PWR.**

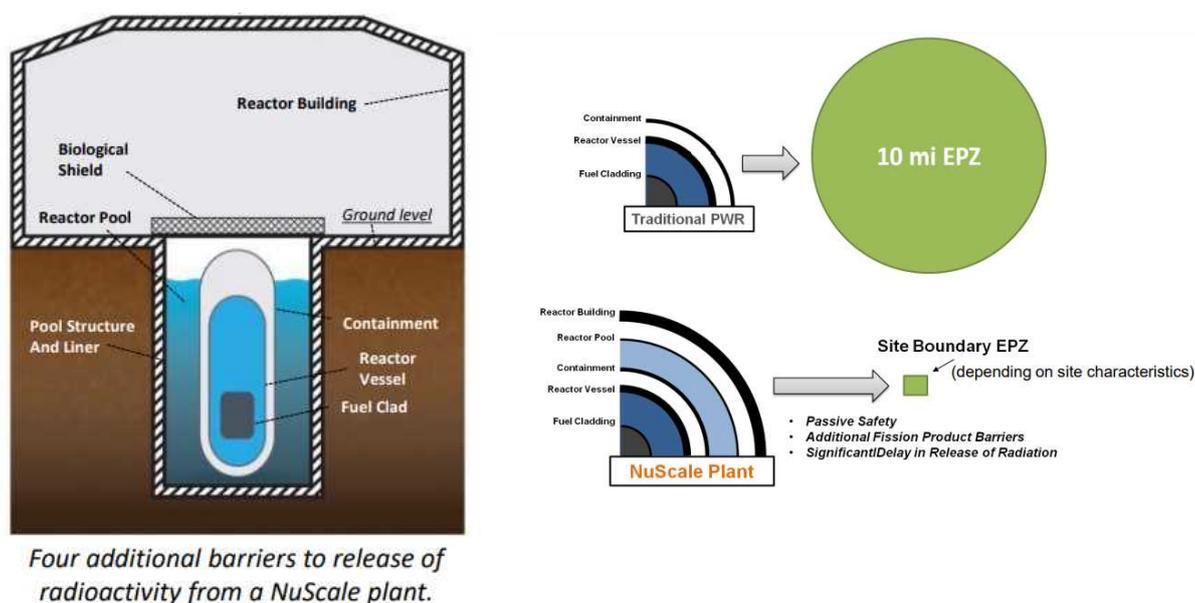
<sup>14</sup> Japan Atomic Energy Research and Development Corporation

(Source: Agency for Natural Resources and Energy, Studygroup of Energy situation (7th meeting)  
(2018/2/27))

It also allows for semi-permanent cooling of nuclear fuel without computer/operator action, alternating current/direct current power supply and additional cooling water for all modules.

As for the installation method, measures are taken to prepare for disasters such as aircraft suddenly and earthquakes. Another major feature is that it requires only a very small emergency planning area compared to conventional plants.

Figure 10: NPM Storage Methods and Areas for Emergency Planning



(Source: Agency for Natural Resources and Energy, Studygroup of Energy situation (7th meeting)  
(2018/2/27))

This case is aimed at implementing SMRs in the U.S., but nuclear power is positioned as one of the key measures for a decarbonisation power source in the process of transitioning to a carbon neutral society in Japan's Sixth Strategic Energy Plan, draft Transition Report of the IEA, EU Taxonomy, etc. However, safety, including final disposal, needs to be sufficiently ensured. This case is the first SMR design in the U.S. that satisfies all the safety and regulatory requirements of the U.S. NRC, and safer final disposal is under consideration in the U.S. As a result, the environmental improvement effect for this case is evaluated to outweigh the likelihood of a negative impact.

---

### Use of Proceeds Category 3: Integrated Social Solutions for Maintenance and Disaster Prevention and mitigation

---

The purpose of this fund is research and development, business development and capital expenditure of thermal peat geographical information observation equipment. This use of proceeds falls under "Circular economy adapted products, production technologies and processes and/or certified eco-efficient products" in the Green Bond Principles and "projects concerning eco-efficient products, production technologies, and processes" among the uses of proceeds illustrated in the Ministry of the Environment's Green Bond Guidelines.

Forests not only contribute to the realization of carbon neutrality through carbon dioxide absorption and sequestration, but also provide a variety of environmental benefits, including conservation of biodiversity, water resource cultivation, and sustainable forest management.

IHI is currently targeting tropical peatlands among forests. Soil in tropical peat land is mostly composed of water, and the remainder is composed of organic material deposited without obscure of plants such as trees. It is distributed in Indonesia, the Congo Basin, and Amazon. It is said to have an area of more than 50 million hectares worldwide (about 1.3 times the area of Japan's land), and the amount of carbon stored is about 119 billion tons (more than 10 times the global carbon emissions in 2017).

Water level management is extremely important because peat lands are very combustible when the basement level falls and dries due to inappropriate land management. The smoke damage caused by peat fires and carbon releases into the atmosphere have become major problems around the world. In 2015, a total of 4.6 million hectares of peat fires occurred in Indonesia, and it is said that 890 million tons of carbon dioxide was discharged (equivalent to 2.5% of the world's carbon dioxide emissions in that year).

IHI will provide Sumitomo Forestry with observational technologies that will contribute to the prevention of peat fires due to stabilization of groundwater levels throughout the year through the company's forestation project in Peat Land in Indonesia and the conservation of 100 thousands hectare of forests owned by Sumitomo Forestry in Indonesia. In this cooperation, peat ground information observation equipment which can measure the ground water level information of peat ground on the ground by knowledge and technology possessed by the IHI group will be developed. Combining the data of this observation equipment with meteorological information and satellite data, a basement level prediction system will be constructed to keep groundwater level stable throughout the annual by fusing with ground data owned by Sumitomo Forestry. In addition, for the creation of "high-quality carbon credits," the government will establish concrete methods for evaluating the value of "natural capital" by utilizing artificial satellite data utilization and weather observation technologies cultivated thus far.

---

#### **Uses of Proceeds Category 4: Reduction CO<sub>2</sub> Emissions in Business Activities (Scope1,2)**

---

**This funding is for capital expenditure and related cost of conversion of fuel of thermal facility in the office, promotion of electrification, renovation to energy-efficient facilities which promote low carbonization. This use of proceeds falls under "energy efficiency", "renewable energy" in the Green Bond Principles and "projects for energy efficiency", "projects for renewable energy" among the uses of funds illustrated in the Ministry of the Environment's Green Bond Guidelines.**

In order to achieve carbon neutrality by 2050 and a reduction of at least 46% by 2030 compared to fiscal 2013 (the goal set by the Japanese government), IHI is promoting low-carbonization of Scope 1, 2 by converting heat source facilities into fuel at project sites, promoting electrification, and upgrading them to energy-saving facilities. In this category, capital expenditure costs related to these initiatives that contribute to reducing CO<sub>2</sub> emissions of IHI's Scope 1,2 are eligible for the use of proceeds.

JCR confirmed that all of IHI's CO<sub>2</sub> emission reduction measures are intended to contribute to the reduction target that IHI intends to achieve by 2030, and that as a reduction measure associated with the company's production activities, they are intended to contribute to a reduction of about 50% compared to fiscal 2019. Therefore, JCR confirmed that they have significant CO<sub>2</sub> reduction effects. IHI is also preparing a more ambitious reduction plan for the next medium-term management plan.

## 2-2. Negative impact on the environment and others

Of IHI's current uses of proceeds, 1 to 3 are expected to be large R&D costs, so the company does not even anticipate a serious negative impact on the environment at this stage. Nevertheless, both projects take potential negative environmental and social impacts into consideration in the evaluation and selection process, and the framework stipulates that the facility subject to the assessment and the procedures for the acquisition of equipment certifications and licenses and environmental assessment required by the countries, regions, and municipalities in the case of the equipment subject to the project are appropriate.

(1) Potential Lock-in to Fossil Fuels

The use of proceeds 1 is research and development aiming at zero emission of transportation means.

For use of proceeds 2, there is a road map for carbon neutrality by 2050 and research and development of small module reactors as decarbonization power source.

Use of proceeds 3 is a measure to increase carbon sequestration by forests.

Regarding the use of proceeds 4, this is a measure for IHI's business activities to eventually become carbon neutrality by 2050.

Accordingly, JCR has evaluated that none of the projects envisaged in this framework are technology locked in to fossil fuels.

(2) Do No Significant Harm Assessment<sup>15</sup>

The use of the proceeds of the Framework may not significantly harm other Green Projects.

(3) Consideration for a Just Transition

JCR confirmed that there are no employment relationships, etc. that could adversely affect the implementation of this project.

## 2-3. Fulfillment of Matters Required in the CTFH

### Element 1: Issuer's Climate Transition Strategy and Governance

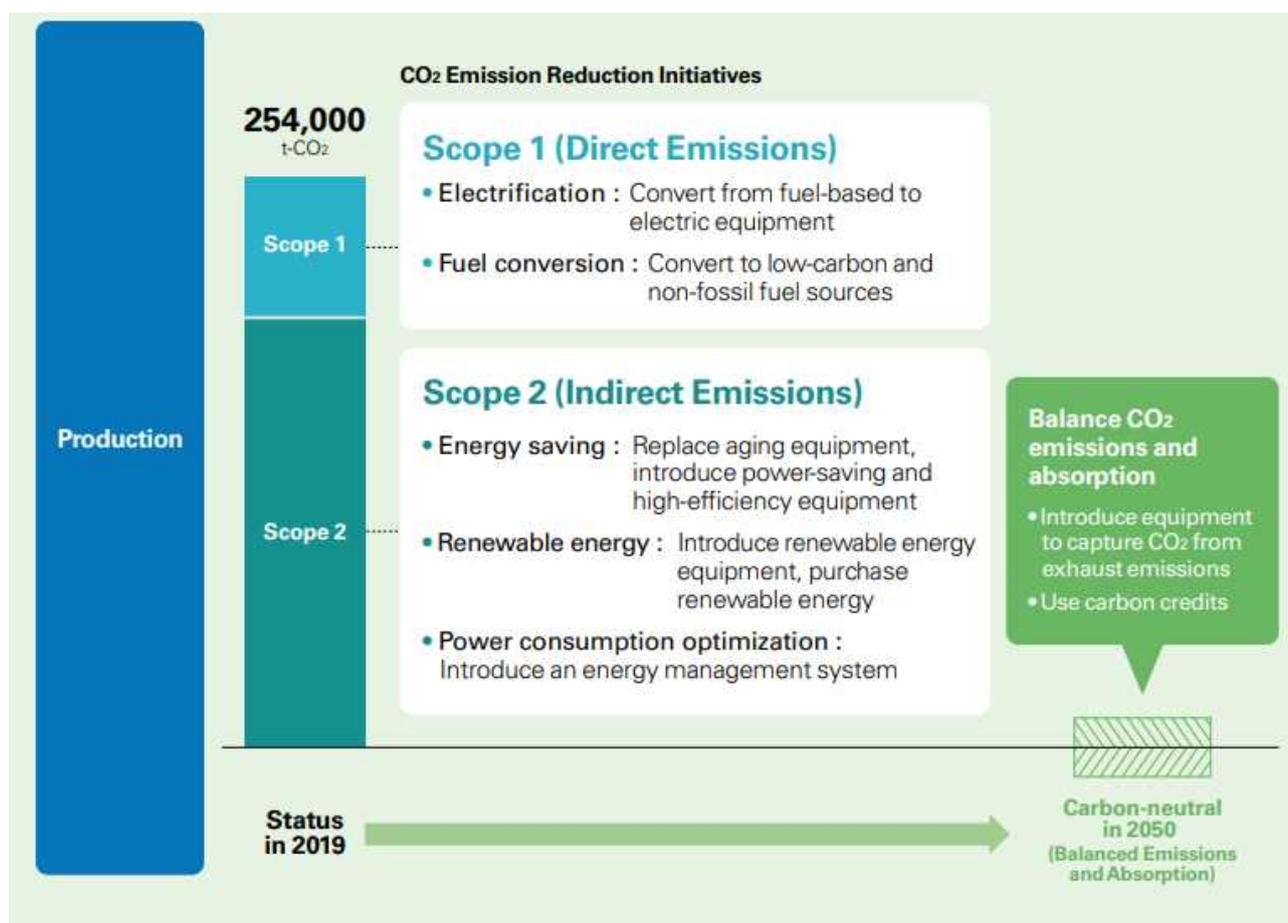
**(1) Whether the borrower that raises funds has a strategy for the transition for climate change mitigation or not.**

In November 2021, IHI set a long-term goal of achieving 2050 carbon neutrality across the entire value chain. Prior to the above target, the company announced Scope 1, 2 milestones in line with the target set forth in the Japanese government's policy (46% reduction in FY2030 compared to FY2013). Regarding Scope3, although the interim reduction targets for the entire IHI Group have not been announced, at the Presentation on Business Activities held on May 17, 2019, the IHI Group announced "aiming to reduce 50% of CO<sub>2</sub> emissions of domestic and overseas customers by 2035" in the Resource, Energy, and Environmental Business Areas which account for the majority of the IHI Group's CO<sub>2</sub> emissions. The use of the Framework's resources is targeted at businesses that contribute to CO<sub>2</sub> reductions efforts across the entire IHI value chain over the medium to long term.

IHI is considering more ambitious reduction plans for Scope 1,2's 2030 targets at the time of the next medium-term management plan. CO<sub>2</sub> emissions for the company's Scope3 are overwhelming compared to Scope 1, 2. However, it is not necessarily appropriate to set a target in the form of a rate of reduction from total Scope3 emissions in recent years because CO<sub>2</sub> emissions in Scope3 are characterized by significant increases or decreases in emissions depending on the type of product delivered during the year, as customers range from mobility, energy, and environmental businesses. For this reason, IHI has been calculating CO<sub>2</sub> savings in fiscal 2030 for achieving Carbon Neutral in 2050. Based on these estimates, the IHI has been setting measures to reduce Scope3.

Figure 11: Scope 1, 2 Emissions of IHI and Future Roadmap

<sup>15</sup> To verify whether implementing the project will hinder other green-eligible projects (projects that contribute to climate change adaptation, pollution/contamination prevention, clean water and ocean conservation, recycling-oriented economies, energy conservation, and the protection of the ecosystem).



(Source: IHI ESG STORY BOOK)

[Consistency with Technology Roadmap in the Power, Chemical, Gas, Aircraft, and Ship Field on "Transition Finance"]<sup>16</sup>

As described in the evaluation section for each use of proceeds, each sector is an important measure for achieving carbon neutrality in the technology roadmap established by the Ministry of Economy, Trade and Industry and the Ministry of Land, Infrastructure, Transport and Tourism related to the product groups that IHI has recently used as funds.

Based on the above, JCR evaluates that the use of proceeds stipulated in this framework will contribute to the expansion of the company's contribution to reducing CO<sub>2</sub> as a Scope 1 of IHI's Transition Strategy and as a strategy for the IHI Group's transition to climate change mitigation as part of the three measures outlined in the Transition Strategy.

**(2) The purpose of using the "Transition" label in procuring funds to contribute to the realization of corporate strategies for Issuer, etc. to move to a business model that can effectively address climate change-related risks and contribute to the achievement of the goals of the Paris Agreement.**

The IHI Group's transition strategy has been developed based on the results of risk scenario analyses in line with TCFD guidance, and JCR has evaluated it as a key strategy for the Group's business model transition.

<sup>16</sup> Ministry of Economy, Trade and Industry December 2021 <https://www.meti.go.jp/press/2021/12/20211210004/20211210004-1.pdf>

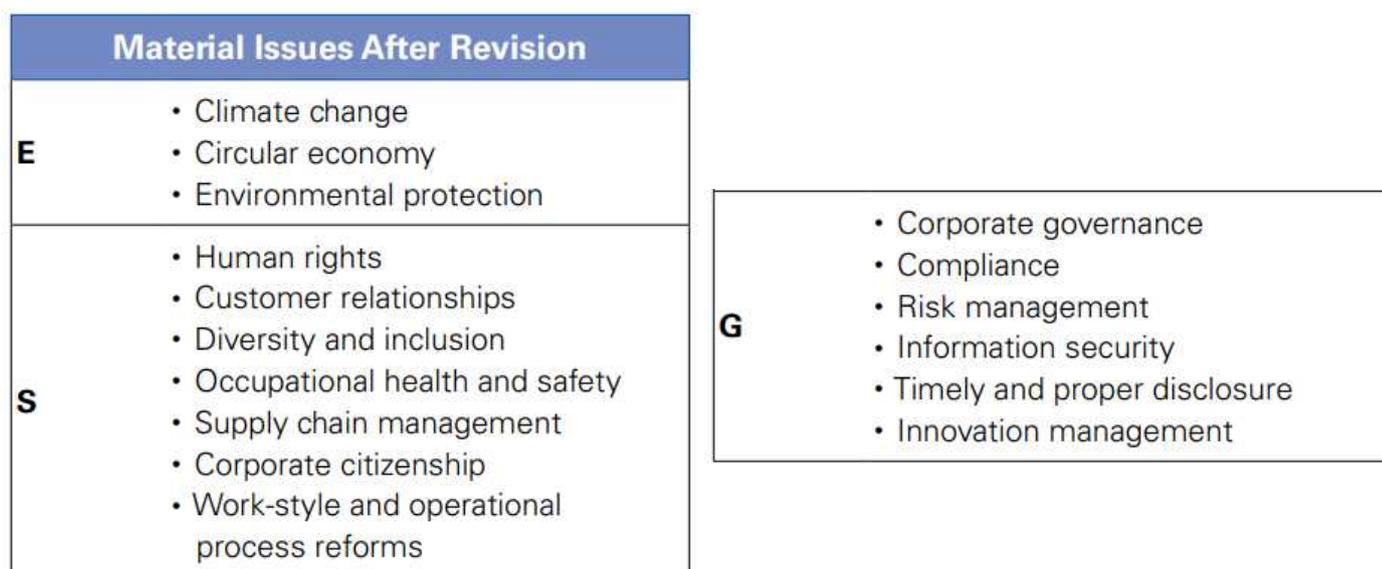
**(3) The governance system established to ensure the effectiveness of the transition strategy.**

In fiscal 2021, IHI established the ESG Management Promotion Committee, chair by the Chief Executive Officer. The purpose is to examine the basic policies and measures of "ESG management" and to evaluate and improve the implementation status. The Environmental Committee, Carbon Neutral Task Force, etc. are placed under the umbrella of the ESG Management Promotion Committee, and JCR evaluates that the organizational system is being strengthened. The Carbon Neutral Taskforce was newly established in FY2021 to formulate group-wide policies and measures for 2050 carbon neutral. As a group-wide initiative, the company promotes teaming across divisions, and aims to collaborate and integrate the knowledge and technologies possessed by each division to reflect them in highly effective roadmaps. Based on the above, IHI assesses that a governance system has been established to ensure the effectiveness of the transition strategy.

**Element 2: Business Model Environmental Materiality**

The IHI Group cites measures against climate change, the formation of a resource recycling-oriented society, and the conservation of the global environment as important issues. In its Project Change, the IHI Group clarifies the social issues that the IHI Group should address (decarbonization, disaster prevention and mitigation, and the realization of affluent lifestyles) and the values that it can provide (creating a society in which nature and technology harmonize) and reexamines important issues.

Figure 12: IHI Group's Materiality



(Source: IHI Sustainability Data Book 2021)

**Element 3: Climate Transition Strategy to be Science-based Including Targets and Pathways**

JCR confirmed the following four points on the IHI Group's roadmap for transitions.

- (1) Quantitatively measurable, covering Scope 1 and 2 (it is desirable that Scope 3 be targeted to the extent feasible)  
 The IHI Group's long-term goals are to achieve carbon neutrality throughout the value chain by 2050, so Scope 1, 2 and 3 are covered to the extent currently feasible.

Item	Boundary	Goal	Achievements in Fiscal 2020
GHG emissions (Scope 1+2)	IHI Group plants and offices	Reduce CO <sub>2</sub> emissions at plants, offices, etc. in line with the government of Japan's target (46% reduction from the FY2013 level by FY2030)  Work toward realization of carbon neutrality in 2050	Scope 1: 60,000t  Scope 2: 170,000t
GHG emissions (Scope 3)	CO <sub>2</sub> Emissions from Domestic and Overseas Customers in the IHI Group's Resource, Energy, and Environmental Businesses Area	50% reduction by fiscal 2035	Fiscal 2021 performances will be announced in fiscal 2022.
	IHI-Group CO <sub>2</sub> Emissions	Work toward realization of carbon neutrality in 2050	

(Source: Prepared by JCR from IHI ESG Story Book, the Sustainability Data Book, and the business domain briefing materials held on May 17, 2019)

JCR has evaluated that the goals set by the IHI Group cover Scope 1, 2, and 3. With regard to Scope3, the targets are set to the extent that they can be ascertained at the present time, although it is difficult to set targets covering the entire Scope3, due to the fact that they vary greatly depending on the content of annual deliveries of products to customers in multiple sectors. Based on the above, JCR evaluate the scope of the IHI Group's target setting as being quantitatively measurable and giving consideration to the entire value chain. In response to the IHI Carbon Neutrality in 2050 declared in November 2021, the IHI Group is in the process of formulating interim reduction targets in order to achieve them. In the process of formulating the next medium-term management plan, which will begin in April 2023, the Group is considering more carefully considered ambitious reduction targets.

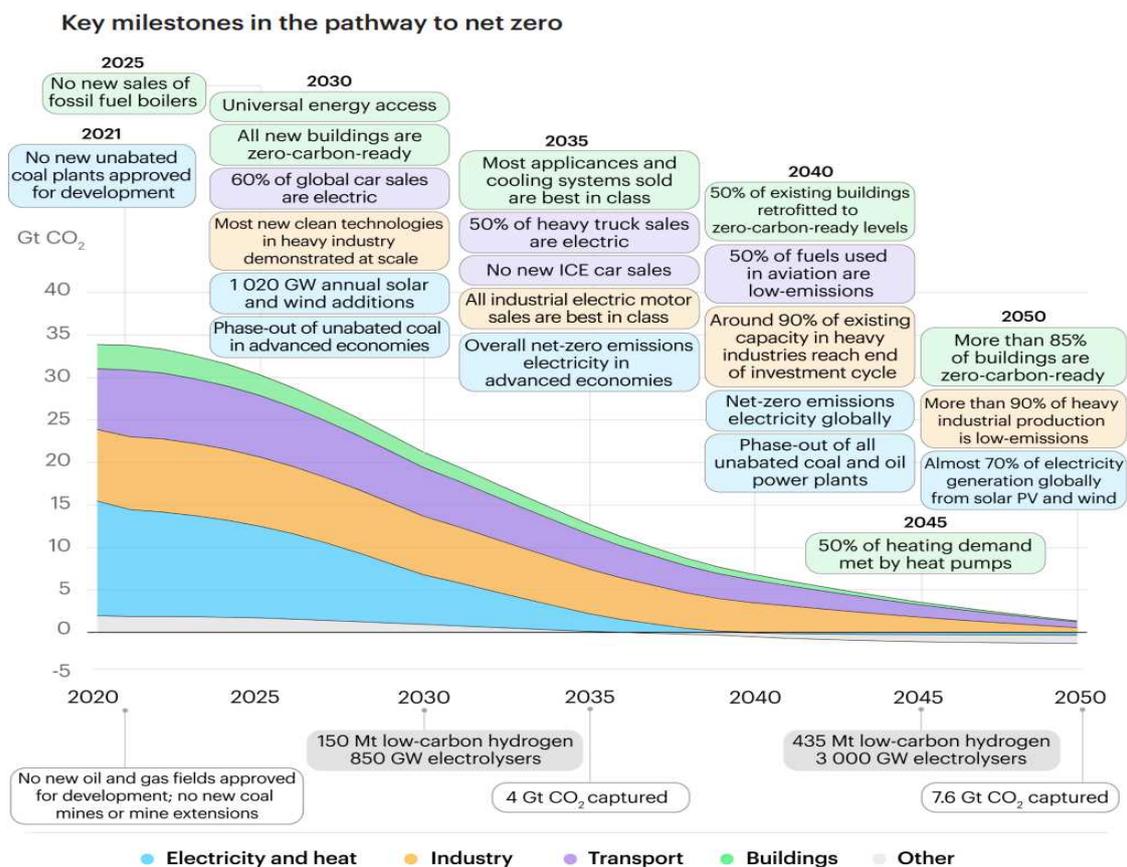
(2) Consistent with targeting based on generally accepted scientific evidence

IHI's Scope 1, 2 is in line with Government of Japan's objectives. However, JCR has evaluated that it is desirable to review the scope of calculation and then reestablish the goal in the future.

As confirmed in the evaluation phase on the use of proceeds, JCR is evaluating that it is also consistent with the Technology Roadmap in the Electricity, Gas, Chemical, Aircraft and Shipping sectors related to "Transition Finance" and aviation roadmap stipulated by IATA

IHI's transition strategy is also consistent with the IEA's Sector Roadmap towards Net Zero for 2050 and the Sixth Strategic Plan for Energy.

Figure 13: IEA's Roadmap for Net Zero in Fiscal Year 2050



(Source: IGES IEA Net Zero by 2050 A Roadmap for the Global Energy Sector)

Figure 14: Outlook for Energy Supply and Demand in Fiscal 2030

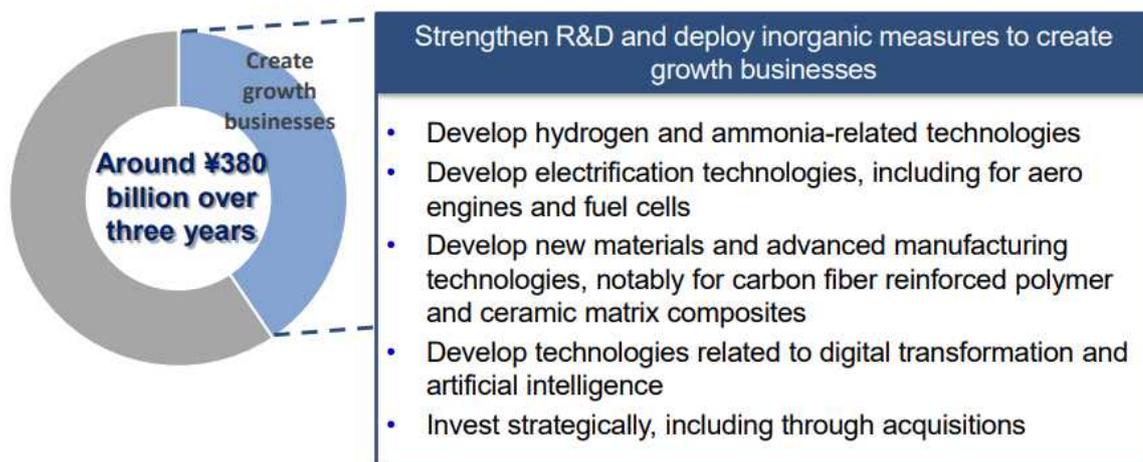
Please refer the website of Ministry of Economy, Trade and Industry

[https://www.meti.go.jp/policy/energy\\_environment/global\\_warming/transition/transition\\_finance\\_roadmap\\_electric\\_jpn.pdf](https://www.meti.go.jp/policy/energy_environment/global_warming/transition/transition_finance_roadmap_electric_jpn.pdf) (P11, Japanese)

#### Element 4: Implementation Transparency

The IHI Group has announced that it will invest about JPY 380 billion in the three years from fiscal 2020. JCR confirmed in an interview that more than 30% of this amount will be allocated to the creation of growth businesses, such as the development of hydrogen and ammonia-related technologies and electrification technologies.

Figure 15: Investment Plan for Carbon Neutral



(Source: Management Review of FY2020 Results and Progress with Project Change)

### <JCR's Views on Satisfying the Transition Finance Handbook and Basic Guidelines>

Based on the above, JCR has evaluated that the Framework satisfies the four elements required by the Climate Transition Finance Handbook and Basic Guidelines.

#### 2-4. Consistency with SDGs

JCR has assessed that the use of resources in the Framework will contribute to the following SDGs goals and targets, with reference to ICMA's SDGs mapping.



#### **Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all**

**Target7.1** By 2030, ensure universal access to affordable, reliable and modern energy services

**Target7.2** By 2030, increase substantially the share of renewable energy in the global energy mix

**Target7.3** By 2030, double the global rate of improvement in energy efficiency



#### **Goal9 : Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

**Target9.1** Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

**Target9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

**Target9.5** Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending



### **Goal12 : Ensure sustainable consumption and production patterns**

**Target12.2** By 2030, achieve the sustainable management and efficient use of natural resources

**Target12.4** By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

**Target12.5** By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse



### **Goal13 : Take urgent action to combat climate change and its impacts**

**Target13.1** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries



### **Goal17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development**

**Target17.7** Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed

**Target17.17** Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

## Evaluation Phase 2: Management, Management, and Transparency Evaluation

Based on the current situation described in detail below and JCR's evaluation of it, JCR evaluated that the management and operation system was firmly established, that the transparency was extremely high, and that the implementation of the project as planned and the appropriation of the procurement funds were sufficiently expected. Based on this evaluation, Phase 2: Management, Operation, and Transparency Evaluation was placed at the highest level, "m1(F)."

### 1. Appropriateness and transparency of the standards for selecting The Use of Proceeds and its process

#### 1-1. JCR's Key Consideration in this factor

In this section, JCR confirms that the objectives to be achieved through the green/Transition Projects, the criteria for selecting green projects, the appropriateness of the process, and the series of processes are appropriately disclosed to lenders.

#### 1-2. Current Situation of Evaluation Targets and JCR Evaluation

##### a. Goal

IHI formulated its medium-term management plan, the Project Change, in November 2020. The three social issues that the IHI Group should address in order to realize its goal of "a world where nature and technology work in unity" are "reducing greenhouse gas emissions (Become carbon-free)," "preparing for increasingly frequent and severe weather related disasters (Prevent and mitigate disasters)," and "Materialize fulfilling lifestyles."



(Source: Management Review of FY2020 Results and Progress with Project Change)

The Project Change defines three growth businesses: "Air transportation systems," "Carbon solutions," and "Maintenance and disaster prevention and mitigation." It declares that it will tackle the social issues described above.

In November 2021, IHI announced the "IHI Group's ESG Management" and declared its intention to be carbon neutral across the entire value chain by 2050 (IHI Carbon Neutral 2050)

Figure 16: IHI Carbon Neutral 2050



(Source: IHI ESG STORY BOOK)

IHI's products include aircraft engines, power plant turbines, and other products that emit large amounts of Scope3, and when the carbon neutrality by 2050 target set by the Japanese government is anticipated, carbon neutral initiatives are also required for IHI products used in these so-called high-emission industries. Therefore, the above three growing businesses are required to make efforts to reduce CO<sub>2</sub>.

The eligible criteria for the use of proceeds set forth by IHI in this framework are all relevant to the three growing businesses described above and are considered appropriate by JCR as they contribute to reducing CO<sub>2</sub>.

**< Selection Standards and Processes of this framework >**

**4.2 Project Evaluation and Selection Process**

Our Finance Department, after consultation with business areas, SBUs, the Corporate Planning Department, etc., selects eligible criteria described in "4.1 Use of Proceeds" and target project candidates, and the Finance Manager makes a final decision. In the operation and implementation of projects, we will cooperate with the relevant divisions and regularly monitor them in PDCA cycle.

**<JCR Evaluation of the Framework >**

**b. Selection criteria**

The eligible criteria for the use of proceeds in this framework formulated by IHI have been prepared by the Finance Department after consultation with business areas, Strategic Business Units (SBUs), the Corporate Planning Department, and others, and finalized by the Finance Manager.

The content of the framework is reported to the Chief Executive Officer and the Group Financial Officer, and the involvement of management is appropriate.

JCR evaluates that the above selection criteria are appropriate.

**c. Process**

The Finance Department of IHI shall select eligible criteria and target project candidates after consultation with the business area, SBUs, Corporate Planning Department, etc., and finalize them by the Finance Manager. The target project is determined through the above process with the ESG Investment Plan, which is part of the business plan, as a population approved by the Executive Committee. The operation and implementation of projects are monitored regularly by the relevant divisions.

JCR evaluates the selection process as appropriate and appropriately involves management and related departments within IHI.

As the selection criteria and process of this framework are scheduled to be published in this Evaluation Report, etc., JCR evaluates it to be transparent.

## 2. Appropriateness and transparency of proceeds management

### 2-1. JCR's Key Consideration in this factor

It is generally assumed that the management method of the proceeds varies by the issuer. JCR assesses whether proceeds procured through the Bonds are appropriated to the Green/Transition projects and whether a mechanism and internal system are in place to enable easy tracking and management of the appropriation of proceeds.

JCR also attaches importance to evaluating the management and operation of the unallocated proceeds as well as to confirming that the proceeds procured from the Bond will be allocated to the Green/Transition projects at early stage.

### 2-2. Current Situation of Evaluation Targets and JCR Evaluation

#### <Contents of cash management in this framework>

##### 4.3 Management of Procurement Funds

Transition Bond funding and asset linkage, as well as the management of funding appropriations, are tracked and managed by our Finance Department throughout the internal management process. Tracking results are generally scheduled to be confirmed by the General Manager of the Finance Department on a quarterly basis. Until the proceeds from the Transition Bonds are appropriated, they will be managed in cash or cash equivalents.

We confirm that appropriated and unused funds are properly balanced through quarterly internal audits and quarterly reviews by quarterly auditors and accounting audits, in addition to the tracking management within the Company described above.

#### <JCR Evaluation of the Framework>

IHI manages the funds raised from the Transition Bonds on its books and then checked by Finance Manager quarterly and tracks in the Finance Department until the funds are appropriated. During that time, unused proceeds are managed in cash or cash equivalents.

IHI also conducts semi-annual internal audits and quarterly audit reviews and accounting audits, and the proceeds from the Transition Bonds are expected to be similarly audited.

IHI maintains 10 years of cash management vouchers, and JCR confirms that the maturities of Transition Bonds exceeding 10 years are managed until redemption.

### 3. Reporting

#### 3-1. JCR's Key Consideration in this factor

This section evaluated whether the disclosure system for lenders, etc. before and after the procurement of the Loan is planned in detail and in an effective manner.

#### 3-2. Current Situation of Evaluation Targets and JCR Evaluation

<Contents of Reporting in this framework>

4.4 Reporting		
1) Reporting on the status of appropriation of funds		
<p>With respect to funded status, we will disclose the funded status on our website once a year until the proceeds from the Transition Bonds are fully funded.</p> <p>If, even after the completion of the funding, a project subject to the funding is subject to an event that differs from our initial assumptions, we will promptly disclose on our website the event and the status of the funding accrual.</p>		
2) Impact reporting		
<p>Until the redemption of the Transition Bonds, we will announce the following once a year on our website.</p>		
	Project	Reporting items
1	Initiatives for Zero Emission Mobility	Report the outline of technologies and products, outline and progress of R&D plans and participating projects, etc., and explanations of targeted effects, etc. to the extent possible for disclosure
2-1	Initiatives for Ammonia Exclusive Firing and Establishment of an Ammonia Value Chain	Report the outline of technologies and products, outline and progress of R&D plans and participating projects, etc., and explanations of targeted effects, etc. to the extent possible for disclosure
2-2	Realization of carbon recycling	Report the outline of technologies and products, outline and progress of R&D plans and participating projects, etc., and explanations of targeted effects, etc. to the extent possible for disclosure
2-3	Demonstration of Small Modular Reactor Technology through International Collaboration	Report to the extent that disclosure is possible, such as the outline of technologies and products, and the progress and results of the business
3	Building Regional Solutions Based on Data Collaboration	Report the outline of technologies and products, outline and progress of R&D plans and participating projects, etc., and explanations of targeted effects, etc. to the extent possible for disclosure
4	CO <sub>2</sub> in business activities Reducing Emissions	Report on activities to reduce CO <sub>2</sub> and their effectiveness to the extent practicable.

<JCR Evaluation of the Framework>

##### a. Reporting on the status of appropriation of funds

The use of the Transition Bonds is disclosed to investors in the revised shelf registration statement at the time of issuance of the Bonds. Post-funding appropriations are disclosed annually on the IHI website until

appropriation is made in full. Significant changes in circumstances will also be made public on the website regarding the content of the event and the status of unused funds.

JCR evaluates that the above reporting content is appropriate.

**b. Reporting on the Effectiveness of Environmental Improvements**

IHI has established the report content for the project and its contents as shown in the above table. Regarding the projects, although there will be certain restrictions on the content of disclosure, such as the ongoing research and joint research with other companies, JCR confirmed that IHI will disclose as these as extent possible.

JCR evaluates the appropriation of funds and the content of IHI's items for the reporting of environmental improvement effects as appropriate.

## 4. Organizational Efforts for the Environment

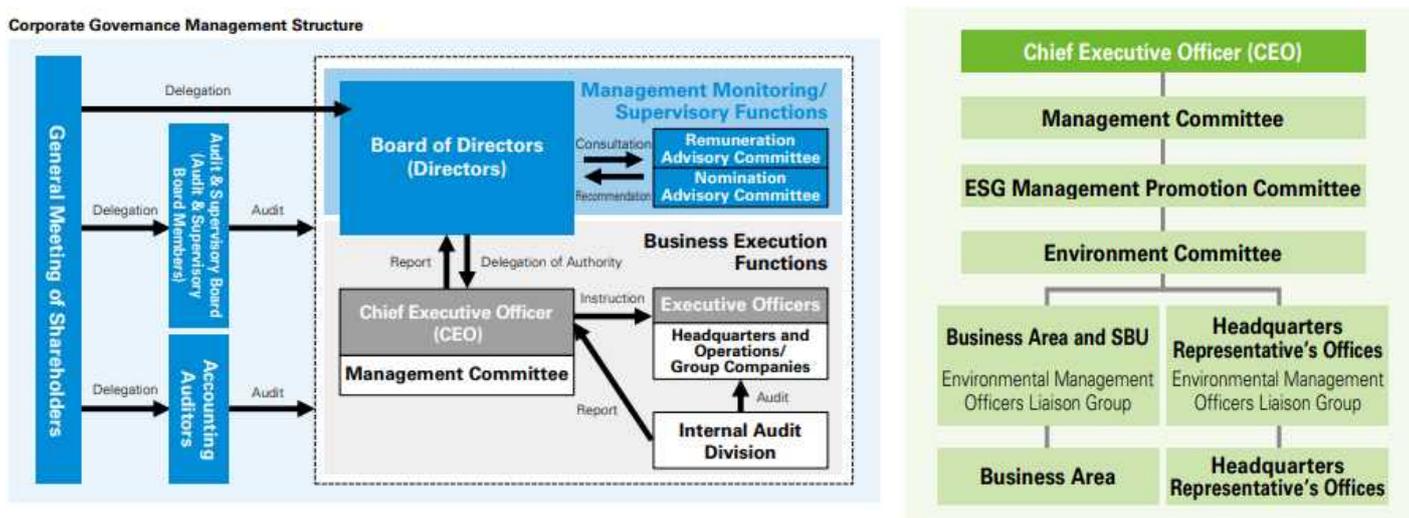
### 4-1. JCR's Key Consideration in this Factors

This section assesses whether the issuer's management considers environmental issues to be of high priority in management, whether the transition finance procurement policy and process, criteria for selecting Green/Transition Projects, etc. are clearly positioned by establishing a department that specializes in the environmental field or through collaboration with external organizations, etc.

### 4-2. Current Situation of Evaluation Targets and JCR Evaluation

IHI is advancing its efforts under the slogan "IHI Carbon Neutral 2050". The ESG Management Promotion Committee and the Environmental Committee have been established within the company to promote this initiative. The ESG Management Promotion Council is a forum for considering IHI's basic ESG management policies and specific measures, and in principle it meets twice a year.

Figure 17: IHI Management Structure



(Source: IHI Sustainability Data Book 2021)

The ESG Management Promotion Committee is chaired by the Chief Executive Officer (CEO), and is constituted of executive officers, general managers, and other members. The ESG Management Promotion Committee examines policies, systems, and action plans for ESG management, and also selects indicators and targets related to them.

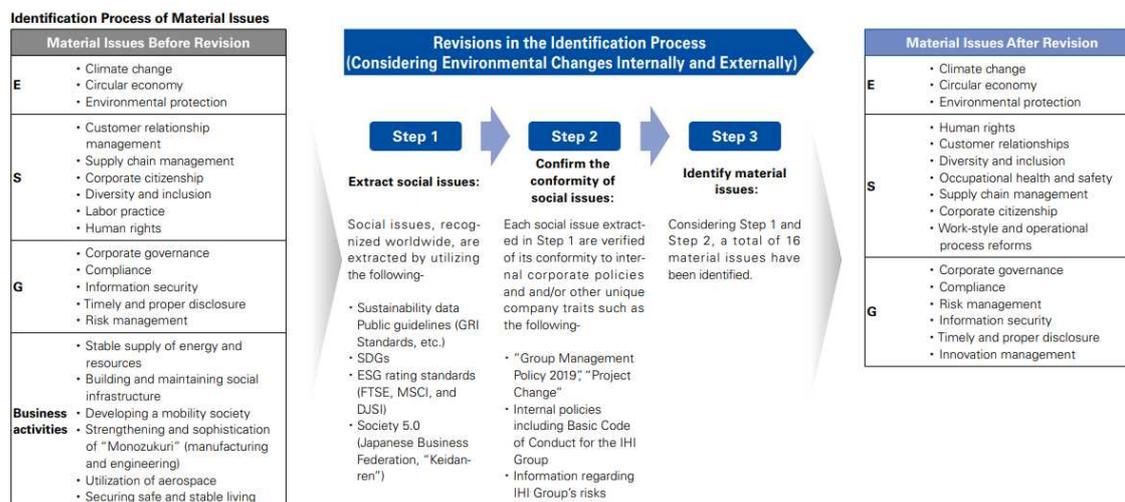
The ESG Management Promotion Committee reports to the Board of Directors and receives management and supervision. In addition, the Board of Directors deliberates on matters that require management judgment in promoting ESG management.

In addition, the ESG Management Promotion Committee has the Environmental Committee, the Group Human Rights Awareness Promotion Committee, and the Carbon Neutral Taskforce under its subordinate organization. The Carbon Neutral Taskforce is a conference body launched in 2021. Members are drawn from business areas, SBUs, division, and regional offices in addition to the corporate divisions, and meetings are held about two to three times a month. The Task Force will formulate the Group's policies and measures for realizing IHI Carbon Neutral 2050. The Environmental Committee implements specific measures related to Scope1, Scope2 in accordance with the policies and measures of the aforementioned task force.

In formulating its project Change, IHI is also reviewing to clarify the social issues that the IHI Group should address in the project Change (Decarbonization, disaster prevention and mitigation, and the creating prosperity in daily life) and the value that can be provided (a world where nature and technology work in unity) from the conventional critical issues.

With regard to these reviews, the Company engages in dialogue with experts inside and outside the Company through the ESG Management Promotion Committee, the Environmental Committee, the Group Human Rights Awareness Promotion Committee, and the Carbon Neutral Taskforce. Details considered to be important of these meetings are reported to the Management Committee and the Board of Directors, and are reflected in important issues.

Figure 18: Re-Identification of Material Issues (Materiality)



(Source: IHI Sustainability Data Book 2021)

Regarding the selection of this project, departments with specialized knowledge, such as business areas and strategic business units (SBUs), are involved. In addition, the company is advancing initiatives for projects with advice from outside experts for individual projects.

JCR confirmed that the opinions of external stakeholders and experts on important issues and individual projects in their respective action policies. In the future, however, it is desirable that basic environmental policies and important issues be verified by external environmental experts, etc.

Based on the above, JCR confirmed that IHI's management has positioned environmental issues as a high-priority issue of high importance for management, that it has re-identified materiality based on the "Project Change" initiatives, and that it has established an ESG management promotion system and is strengthening its carbon neutral initiatives. In addition, in various measures for IHI Carbon Neutral in 2050, JCR confirmed that cooperation with other companies, external organizations, and experts is being attempted, and that concrete investment plans for carbon neutrality are being made.

■Result of evaluation

Based on the JCR Green Finance Evaluation Methodology, JCR assigned "gt1 (F)" for the "Green/Transition Evaluation" and "m1 (F)" for the "Management, Operation, and Transparency Evaluation." Consequently, JCR assigned "Green 1(T) (F)" for the "JCR Climate Transition Finance Evaluation" of the Framework. The Framework is considered to meet the standards for items required by "Green Bond Principles", "CTFH", "Basic Guidelines for Climate Transition Finance", and "Green Bond Guidelines".

[JCR Climate Transition Bond Framework Evaluation Matrix]

		Management, Operation, and Transparency Evaluation				
		m1 (F)	m2 (F)	m3 (F)	m4 (F)	m5 (F)
Green/Transition Evaluation	gt1 (F)	Green 1 (T) (F)	Green 2 (T) (F)	Green 3 (T) (F)	Green 4 (T) (F)	Green 5 (T) (F)
	gt2 (F)	Green 2 (T) (F)	Green 2 (T) (F)	Green 3 (T) (F)	Green 4 (T) (F)	Green 5 (T) (F)
	gt3 (F)	Green 3 (T) (F)	Green 3 (T) (F)	Green 4 (T) (F)	Green 5 (T) (F)	Not qualified
	gt4 (F)	Green 4 (T) (F)	Green 4 (T) (F)	Green 5 (T) (F)	Not qualified	Not qualified
	gt5 (F)	Green 5 (T) (F)	Green 5 (T) (F)	Not qualified	Not qualified	Not qualified

(Responsible analysts for this evaluation) Atsuko Kajiwara and Kosuke Kajiwara

---

## Important explanation of the Climate Transition Finance evaluation

---

### 1. Assumptions, Significance, and Limitations of JCR Climate Transition Finance Evaluation

JCR Climate Transition Finance Evaluation, which is assigned and provided by the Japan Credit Rating Agency (JCR), represents JCR's overall opinion at the present time as to the extent to which funds procured from the Transition Financing, which are subject to evaluation, are appropriated for the Green/Transition Projects as defined by JCR, and the extent to which JCR's efforts to manage, operate and ensure transparency of such Transition Financing, etc., and does not fully represent the extent of management, operations and transparency efforts related to the appropriation of funds procured from the Transition Financing and The Use of Proceeds, etc.

JCR Climate Transition Finance evaluation evaluates plans or circumstances, such as the appropriation of funds at the time of funding plans or at the time of funding of the Transition Financing, and there is no guarantee that funds will be appropriated or otherwise in the future. In addition, JCR Climate Transition Finance Evaluation does not demonstrate the effect of Transition Finance on the environment and is not responsible for its effect on the environment. JCR confirms that the effects of the funds procured from transition Finance on the environment are measured quantitatively and qualitatively by the borrower or by a third party requested by the borrower, but in principle it does not directly measure the effects.

### 2. Methods used in the conduct of this evaluation

The methods used in this evaluation are listed on JCR website (Sustainable Finance & ESG in <https://www.jcr.co.jp/en>) as JCR Green Finance Evaluation Methodology.

### 3. Relationship with Acts Related to Credit Rating Business

JCR Climate Transition Finance Evaluation is determined and provided by JCR as an ancillary business, which is different from the activities related to the credit rating business.

### 4. Relationship with Credit Ratings

The Evaluation differs from credit ratings and does not promise to provide or make available for inspection a predetermined credit rating.

### 5. Third Party character of JCR

There is no conflict of interest related to capital or human resources relationships between the subject of this evaluation and JCR.

---

## Disclaimers

The information contained in this document has been obtained by JCR from the Borrower and from accurate and reliable sources. Provided, however, that such information may be erroneous due to human, mechanical or other reasons. Accordingly, JCR makes no representation or warranty, express or implied, as to the accuracy, results, accuracy, timeliness, completeness, marketability, or fitness for a particular purpose of such information, and JCR assumes no responsibility for any error, omission, or result of using such information. In no event shall JCR be liable for any special, indirect, incidental or consequential damages of any kind, including opportunity loss, monetary loss, which may arise from any use of such information, whether contractual, tort, negligence or other cause of liability, and whether or not such damages are foreseeable or unforeseeable. The JCR Climate Transition Finance Evaluation does not express an opinion on various risks (credit risk, price fluctuation risk, market liquidity risk, etc.) related to transition finance, which is the subject of evaluation. Furthermore, the JCR Climate Transition Finance Evaluation Finance Evaluation represents JCR's comprehensive opinion as of the date of this report and is not a representation of the facts. It does not constitute a recommendation in any way as to the decision of risk or the purchase, sale or holding of individual bonds, commercial paper, etc. The JCR Climate Transition Finance Assessment Finance Assessment may be changed, interrupted, or withdrawn due to changes in information, a lack of information, or other reasons. All rights to this document, including data from JCR Climate Transition Finance Assessment Finance Assessment, are reserved by JCR Climate Transition Finance Assessment. Any reproduction, translation, modification, etc. without the permission of JCR Climate Transition Finance Assessment is prohibited, regardless of the part or all of this document, including data from JCR Climate Transition Finance Assessment Finance Assessment.

### ■Glossary

JCR Climate Transition Finance Evaluation: The evaluation assesses the extent to which funds raised through transition financing will be allocated to green/transition projects as defined by JCR, as well as the degree of management, operations, and transparency initiatives related to the use of such transition financing, etc. The evaluation is on a five-point scale, from top to top, and is displayed using the rating symbols Green1 (T), Green2 (T), Green3 (T), Green4 (T), and Green5 (T).

### ■Status of registration as an external assessor of green finance

- Ministry of the Environment's external green bond reviewer registration
- ICMA (registered as an observer with the International Capital Markets Association)
- Members of UNEP FI Positive Impact Financial Principles Working Groups
- Climate Bonds Initiative Approved Verifier (Climate Change Initiative Accreditation Verification Organization)

### ■Status of registration as a credit rating agency, etc.

- Credit Rating Agency: the Commissioner of the Financial Services Agency (Rating) No.1
- EU Certified Credit Rating Agency
- NRSRO: JCR has registered with the following four of the five credit rating classes of the Securities and Exchange Commission's NRSRO(Nationally Recognized Statistical Rating Organization. (1)Financial institutions, broker dealers, (2) insurance companies, (3) general business corporations, and (4) government and local governments. If the disclosure is subject to Section 17g-7(a) of the Securities and Exchange Commission Rule, such disclosure is attached to the news releases posted on the JCR website (<https://www.jcr.co.jp/en/>).

### ■For further information, contact

Information Service Department TEL: 03-3544-7013 FAX:03-3544-7026

### Japan Credit Rating Agency, Ltd.

Jiji Press Building, 5-15-8 Ginza, Chuo-ku, Tokyo 104-0061, Japan  
Tel. +81 3 3544 7013, Fax. +81 3 3544 7026

Copyright © Japan Credit Rating Agency, Ltd. All rights reserved.