

# ClassNK's Efforts to Reduce GHG Emissions from Ships

Planning Division, Zero-Emission Transition Center, ClassNK  
Plan Approval and Technical Solution Division, Marine GHG Certification Department, ClassNK

## 1. INTRODUCTION

The International Maritime Organization (IMO) adopted its initial strategy on reduction of GHG emissions from international shipping in 2018. This IMO strategy lays out a goal of achieving zero GHG emissions as early as possible within this century as the final non-binding target for GHG emissions reduction, and improving CO<sub>2</sub> emissions per transport work by at least 40% by 2030 and at least 70% by 2050 (both from 2008), with the goal of reducing total GHG emissions by at least 50% by 2050 in comparison with 2008.

Based on this strategy, at the 76<sup>th</sup> session of the Marine Environment Protection Committee held in June 2021 (MEPC 76), the Committee adopted amendments to Annex VI of the MARPOL Convention for introducing an “EEXI regulation” and a “CII rating” intended to reduce CO<sub>2</sub> emissions from ships in service in order to ensure that international shipping as a whole will achieve a target of reducing the CO<sub>2</sub> emission per transport work by at least 40% by 2030 from 2008 (2030 target)<sup>1)</sup>. These regulations will be introduced in 2023.

Broadening our perspective from international shipping to the entire world, because more than 120 countries and regions, including Japan, have now declared their intentions to achieve “carbon neutrality in 2050,” efforts to reduce GHG emissions are expected to be strengthened in many countries. Together with these regulations, similar efforts led by the private sector are also underway in the maritime transportation business, suggesting that movements toward zero emissions will be accelerated.

This paper introduces the outlines of the “EEXI regulation” and the “CII rating” which will be introduced in 2023, ClassNK's response to those programs and the outline of “ClassNK Zero-Emission Transition Support Services” being developed by ClassNK.

## 2. OUTLINE OF EEXI REGULATION AND RESPONSE OF CLASSNK

### 2.1 Outline of EEXI Regulation

The EEXI regulation is a framework for reducing CO<sub>2</sub> emissions from ships in service by setting a certain standard for the energy efficiency of those ships. The ship's energy efficiency is evaluated by the Energy Efficiency Existing Ship Index (EEXI), which is similar to the Energy Efficiency Design Index (EEDI). The regulation requires that the attained EEXI value of each individual ship must satisfy the required EEXI value (Fig. 1). If the attained EEXI value of an individual ship does not satisfy the required EEXI value, action such as limiting the engine power of the ship or installing additional energy-saving devices must be taken.

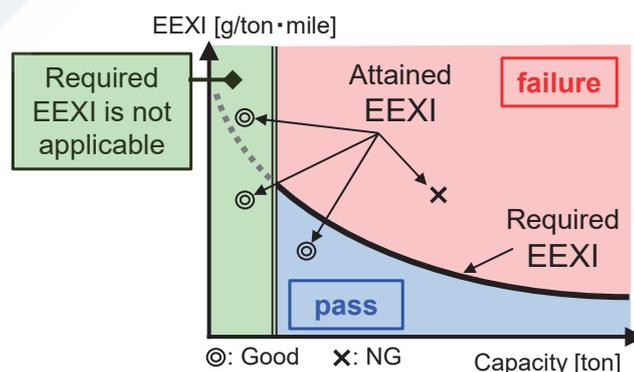


Fig. 1 Relationship between attained EEXI and required EEXI

### 2.1.1 Ships Subject to EEXI Regulation

The EEXI regulation applies to all ships of 400 GT and above that are engaged in international voyages regardless of the delivery date of the ship. However, as with the EEDI regulation, this regulation will not apply to ships not propelled by mechanical means.

### 2.1.2 Attained EEXI and Required EEXI

The EEXI is calculated by using a formula similar to that of the EEDI <sup>2)</sup>. As its basic concept, EEXI is calculated by dividing the product obtained by multiplying “engine output” by “fuel consumption” and a “CO<sub>2</sub> conversion factor,” by the “carrying capacity” and “ship speed,” and represents the estimated CO<sub>2</sub> emissions when 1 ton of cargo is transported 1 nautical mile.

The EEXI values of ships to which EEDI is applied are calculated by using the vessel speed, which is obtained from the power curve used in EEDI certification. In the EEXI calculation for a ship which is not subject to the EEDI regulation, the ship speed is determined based on the result of a tank test, numerical computation of CFD, etc. or a speed trial in the full loaded condition, if any of those has been conducted, and if none of those has been conducted, the ship speed is calculated by using a simplified formula.

While the EEXI regulation applies to ships of 400 GT and above engaged in international voyages, the ships required to meet the required EEXI vary by ship type and size. For example, for bulk carriers, the EEXI calculation is required for vessels of 400 GT and above, and vessels of 10,000 DWT and above are required to comply with the required EEXI. For tankers, the EEXI calculation is required for those of 400 GT and above, and those of 4,000 DWT and above are required to comply with the required EEXI. The Required EEXI is determined by an “EEDI reference line,” which is the baseline of the EEDI, and a “reduction factor (X)” (Fig. 2).

$$\text{Required EEXI} = \left(1 - \frac{X}{100}\right) \times \text{EEDI Reference Line}$$

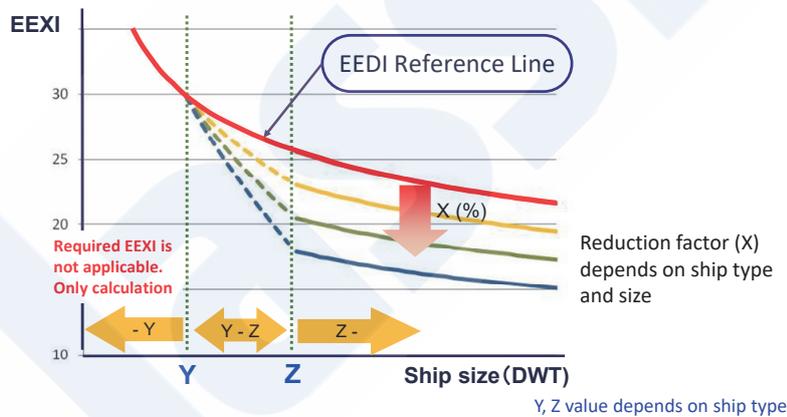


Fig. 2 Relationship between Required EEXI, EEDI reference line and reduction factor

Under the EEDI regulation, required values begin with Phase 0 according to the “contract date” and “delivery date,” and are set so as to become stricter in stages from Phase 1 to Phase 2 and Phase 3. By contrast, the EEXI regulation requires a certain value with no stepwise strengthening of the required value. This required value is basically set at the same level as the required EEDI value as of 2023 (when the EEXI regulation takes effect). Ships such as bulk carriers, tankers and vehicle carriers are required to meet a required value equivalent to Phase 2 of EEDI, while ships such as containerships, general cargo ships, LNG carriers and gas carriers are required to meet a required value equivalent to Phase 3 of EEDI (Fig. 3). However, the required values are slightly relaxed for bulk carriers of 200,000 DWT and above, tankers of 200,000 DWT and above and containerships of less than 120,000 DWT, ro-ro cargo ships and ro-ro passenger ships, as it is assumed that it would be technically difficult to achieve a substantial improvement in the energy efficiency of ships in service.

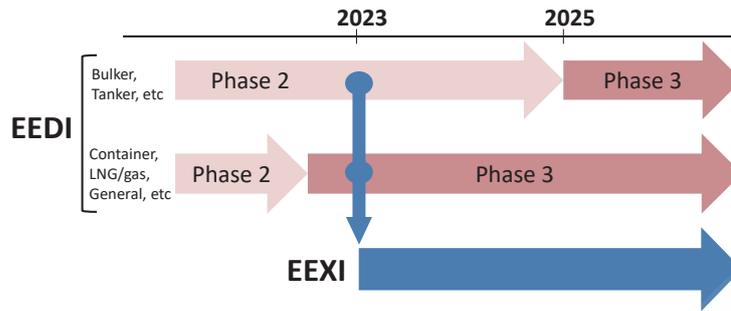


Fig. 3 Relationship between Required EEDI and Required EEXI

2.1.3 Timeline of EEXI Regulation

Application of the EEXI regulation will start on 1 January 2023. Ships delivered before 1 January 2023 must comply with the EEXI regulation at the first annual, intermediate or renewal survey of IAPP Certificate on or after 1 January 2023. Ships delivered on or after 1 January 2023 are required to comply with the EEXI regulation at the initial survey of the IEE Certificate, that is, before the ship's delivery.

2.2 Status of Compliance with EEXI Regulation and Response of ClassNK

2.2.1 Status of Compliance with EEXI Regulation

Among the ships registered in the ClassNK, approximately 7,200 are subject to the EEXI regulation, consisting of approximately 5,300 ships to which the EEDI is not applied, approximately 750 ships to which the EEDI is applied but which do not comply to the required EEXI and approximately 1,150 ships that already comply with the required EEXI. Thus, approximately 6,050 ships must respond to the EEXI regulation, which is equivalent to about 84% of ships subject to the EEXI regulation (Table 1). Among the ships which need to take action to meet the EEXI regulation, bulk carriers account for approximately 86%, tankers approximately 73%, containerships approximately 80% and gas carriers approximately 90%, indicating that an extremely large number of ships must take action to satisfy the EEXI regulation (Fig. 4).

Table 1 Status of EEXI compliance of ships registered in ClassNK

Ships subject to EEXI regulation	7,200	
Ships not subject to EEDI	5,300	Action needed 6,050 (84%)
Ships subject to EEDI (ships not subject to EEXI regulation)	750	
Ships subject to EEDI (ships subject to EEXI regulation)	1,150	No action needed 1,150 (16%)

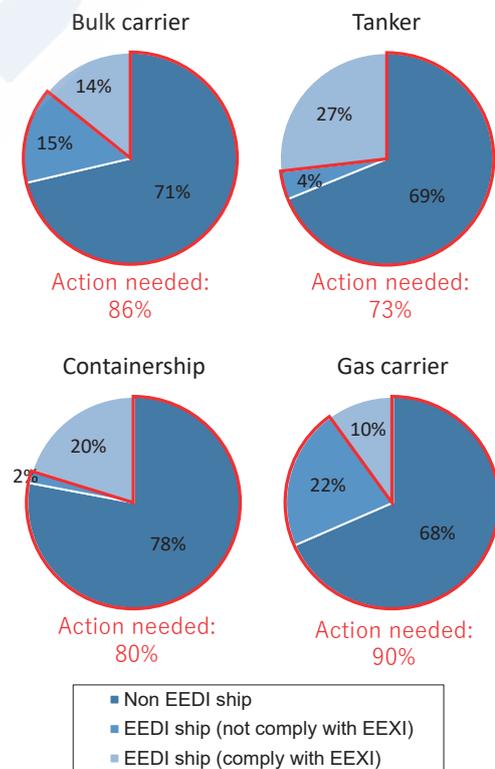


Fig. 4 Status of EEXI compliance of ships in ClassNK registry by ship type

### 2.2.2 Response to EEXI Regulation

Fig. 5 shows the flowchart for ship owners / management companies to judge whether any kind of action is needed or not in order to comply with the EEXI regulation.

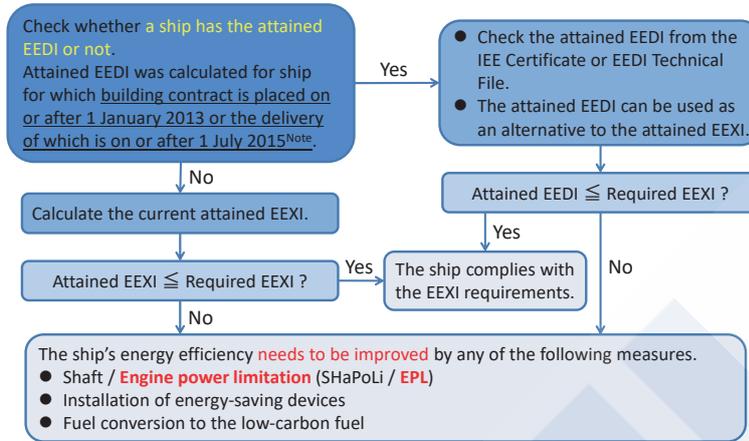


Fig. 5 Flowchart of response to EEXI regulation

If the ship is subject to the EEDI regulation, it is necessary to check the attained EEDI value indicated in the ship’s IEE certificate or EEDI technical file to confirm whether or not the value satisfies the required EEXI. If the value satisfies the required EEXI, the attained EEDI value can be used as the attained EEXI value.

If the ship’s EEDI value does not exceed the required EEXI, the ship can be considered as already satisfying the EEXI regulation, and it is unnecessary to be taken any particular action to improve the ship's energy efficiency. If the EEDI value is larger than the required EEXI, it is necessary to improve the energy efficiency of the ship by taking measures such as limiting the main engine power<sup>3)</sup>, adding or improving energy-saving devices, improving propulsion efficiency through measures such as the optimization of the propeller and/or bow shape, conversion to low-carbon fuel, etc.

For ships to which the EEDI regulation has not been applied, it is necessary to first calculate the ship’s current EEXI value in order to determine whether or not it satisfies the required EEXI. If the value satisfies the required EEXI, it is not necessary to take any special action to improve the ship's energy efficiency. However, if the value does not satisfy the required EEXI, it is necessary to take some form of measures that will contribute to improving the ship's energy efficiency.

### 2.3 Response of ClassNK to EEXI Regulation

ClassNK has prepared a simplified EEXI assessment tool called “EEXI Simplified Planner,” which enables shipping companies to determine whether or not their own ships comply with the EEXI regulation in a simplified manner. This tool is available on the ClassNK website (Fig. 6).

This assessment tool makes it possible to estimate the limit value of the main engine output for meeting the EEXI regulation, and to estimate the amount of reduction in vessel speed in case the main engine power is limited. It should be noted that this assessment tool is intended solely to enable ship companies to perform simplified calculations, and is different from actual certification.

Bulk carrier				DWT		Crew (Impact)				
a	b	c	d	e	f	g	h			
161.79	10.6585	23.7110	0.477	0.02708	0.54387	25,000	25			
Bulk carrier				DWT		Crew (Impact)				
161.79	10.6585	23.7110	0.477	0.02708	0.54387	25,000	25			
Bulk carrier	Unit	Before EPL	After EPL	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7
Displacement	DWT	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Capacity	10000000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
MCR <sub>reg</sub>	kW	18,500	18,500	18,500	18,500	18,500	18,500	18,500	18,500	18,500
MCR <sub>reg</sub> (P <sub>max</sub> /0.83)	kW	-	10,472	9,578	9,115	8,707	8,308	7,908	7,508	7,108
P <sub>max</sub>	brake	18,529	13,48	12,28	11,26	10,25	9,25	8,25	7,25	6,25
W <sub>max</sub>	brake	14.79	-	-	-	-	-	-	-	-
margin	g	7.4	-	-	-	-	-	-	-	-
P <sub>max</sub>	kW	13,875	8,892	8,282	7,702	7,152	6,632	6,132	5,652	5,192
P <sub>max</sub>	kW	718	718	718	718	718	718	718	718	718
SFC <sub>reg</sub>	g/kWh	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
SFC <sub>max</sub>	g/kWh	215.0	215.0	215.0	215.0	215.0	215.0	215.0	215.0	215.0
CF <sub>max</sub>	1-CO <sub>2</sub> /P <sub>max</sub>	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
CF <sub>reg</sub>	1-CO <sub>2</sub> /P <sub>reg</sub>	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
W <sub>max</sub>	1,0111	1,0111	1,0111	1,0111	1,0111	1,0111	1,0111	1,0111	1,0111	1,0111
W <sub>reg</sub>	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
AEI EEXI	g CO <sub>2</sub> /t mile	3.27	2.87	2.81	2.80	2.80	2.80	2.80	2.80	2.80
Reference line	g CO <sub>2</sub> /t mile	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994
Reduction rate (%)		29%	29%	29%	29%	29%	29%	29%	29%	29%
Reg. EEXI	g CO <sub>2</sub> /t mile	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
AEI EEXI / Reg. EEXI	g CO <sub>2</sub> /t mile	1.368	1.053	1.004	1.000	1.000	1.000	1.000	1.000	1.000
Judgement		Not Comply	Not Comply	Not Comply	Comply	Comply	Comply	Comply	Comply	Comply
MCR <sub>reg</sub> (P <sub>max</sub> /0.83) / MCR <sub>reg</sub>		-	56.0%	50.9%	49.0%	47.6%	46.5%	45.5%	44.5%	43.5%
DP	brake	-	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11

Fig. 6 Simplified EEXI assessment tool “EEXI Simplified Planner”

### 3. OUTLINE OF CII RATING AND RESPONSE OF CLASSNK

#### 3.1 Outline of CII Rating

The CII rating is a framework for promoting fuel efficiency improvement in international shipping as a whole by checking the annual fuel consumption of each ship and rating the ship according to the results. Specifically, the fuel consumption (CII: Carbon Intensity Indicator) of individual ships is calculated every year based on the IMO's Data Collection System (IMO-DCS), which was implemented in 2019, and ships are rated in five levels (A, B, C, D and E) based on their deviation from a required value set for each ship type (Fig. 7). For low-rated ships with a rating result of E in any year or a rating of D for 3 consecutive years, it is necessary to formulate a fuel efficiency improvement plan which includes navigation at reduced speed (slow steaming), selection of optimum routes and appropriate maintenance, fill out a Ship Energy Efficiency Management Plan (SEEMP) and obtain the approval of the Administration or the ship classification society. For high-rated ships with ratings of A or B, it is recommended that the Administrations or the port authorities provide incentives.

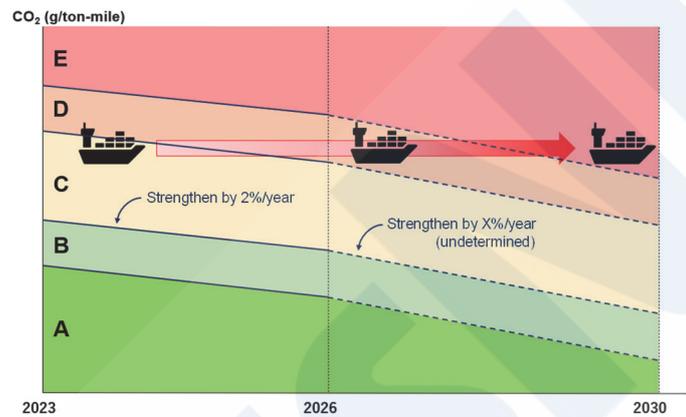


Fig. 7 CII rating

##### 3.1.1 Ships Subject to CII Rating

As in the case of the IMO-DCS, the CII rating is applied to all ships of 5,000 GT and above (bulk carriers, gas carriers, tankers, containerships, general cargo ships, refrigerated cargo carriers, combination carriers, vehicle carriers, ro-ro cargo ships, ro-ro passenger ships, LNG carriers and cruise passenger ships) that are engaged in international voyages.

##### 3.1.2 Attained CII and Required CII

The attained CII value of each ship is the CO<sub>2</sub> emission per deadweight tonnage-mile (gross tonnage-mile for vehicle carriers, ro-ro passenger ships and cruise passenger ships) based on the actual results of fuel consumption in the previous year<sup>4)</sup>. The formula is as follows, where CO<sub>2</sub> emissions are calculated by multiplying the ship's fuel consumption by a CO<sub>2</sub> conversion factor. Because emissions can be calculated using only the data collected under the IMO-DCS system, it is not necessary to collect additional data.

$$\text{Attained CII} = \frac{\text{CO}_2 \text{ emissions}}{(\text{DWT or GT}) \times \text{Distance travelled}}$$

In addition, the required CII value will be strengthened every year based on the CII reference value (CII reference line)<sup>5)</sup> calculated by each ship type in 2019. The required CII in 2023, when the system begins, will be a reduction of 5% from 2019, after which the reduction factor will be strengthened by 2% every year until 2026<sup>6)</sup>. The yearly reduction factors from 2027 to 2030 will be determined by 2025 based on the condition of GHG reductions in the future (Table 2).

$$\text{Required CII} = \frac{100 - Z}{100} \times \text{CII reference value}$$

Table 2 Reduction factor (Z) for the CII relative to 2019

Year	Reduction factor (Z)
2023	5%
2024	7%
2025	9%
2026	11%
2027	(to be decided)
2028	(to be decided)
2029	(to be decided)
2030	(to be decided)

The correction factors for ship types in the CII calculation and the requirements for exclusion of voyages are under continuing deliberation in the IMO.

### 3.1.3 Timeline of CII Rating

The CII rating will be started on 1 January 2023, and fuel consumption and other data in 2023 will be subject to the rating. The rating for 2023 will be conducted in 2024.

Ships subject to this rating system must enter “CII calculation method,” “Required CII value for the coming 3 years,” “implementation plan for achieving the required CII value” and “procedures for self-evaluation and improvement” in the ship’s SEEMP and obtain the approval of the Administration or the ship classification society by 1 January 2023.

### 3.1.4 Evaluation Method for CII Rating

In the CII rating, the CII value for each ship is calculated, and ships are evaluated in the five levels of A, B, C, D and E according to their deviation from the required CII value in that year<sup>7)</sup>. It should be noted that this rating is not based on a relative evaluation, but on an absolute evaluation against the required CII, which will be strengthened every year (Fig. 8). Therefore, if a ship’s fuel consumption results are similar for each year, its rating will be downgraded at some point in time.

This CII rating system is not intended to impose a penalty such as suspension of operation even if a ship’s rating result is low. However, if the rating result is E in any year or D for 3 consecutive years, it is necessary to prepare a fuel efficiency improvement plan for the next fiscal year and beyond, make the required entries in the SEEMP and obtain the approval of the Administration or the ship classification society. The IMO guidelines on matters such as the specific method of entering this improvement plan in the SEEMP are to be finalized at MEPC 78 in June 2022.

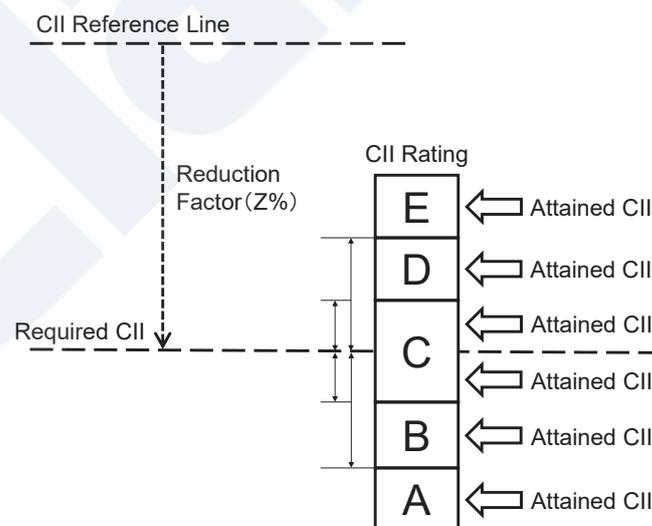


Fig. 8 Required CII and CII rating

### 3.2 Response of ClassNK to CII Rating

The following introduces the improvement of the ClassNK MRV Portal and the CII simple assessment tool as ClassNK's response to the CII rating.

#### 3.2.1 ClassNK MRV Portal

ClassNK has provided the ClassNK MRV Portal since 2017 so that ship companies can respond efficiently to IMO-DCS and EU-MRV regulations. This data collection and management system makes it possible to receive fuel consumption and other data from the ship or third-party software, prepare and submit annual reports (EU MRV Emission Report and IMO DCS Annual Report) managed on the website and acquire certification by ClassNK.

ClassNK is conducting work to improve the ClassNK MRV Portal by adding the functions described below toward the start of the CII rating.

##### 3.2.1.1 Preparation of Annual Report and Improvement Plan

To reduce additional work of ship companies related to data reporting and verification associated with the CII rating, ClassNK will add information on CII in IMO DCS Annual Report which are prepared automatically on the ClassNK MRV Portal. Since it is necessary to prepare a plan of corrective actions for the next fiscal year and beyond if the rating result is E for any year or D for 3 consecutive years, ClassNK will also add a function to support preparation of improvement plan documents by selecting the improvement measures to be implemented in the next fiscal year and thereafter from a list of options such as the weather routing, just in time, propeller cleaning, etc. on the portal.

#### 3.2.2 Simplified CII assessment Tool

ClassNK has created a simplified CII assessment tool and made it available on the ClassNK website (Fig. 9). This assessment tool is capable of automatically calculating the ship's CII rating when the user enters a ship type, DWT and the annual values of fuel consumption and distance travelled. It should be noted that this is an assessment tool that allows ship companies to perform calculation voluntarily, and is different from actual verification.



CII Calculation		ClassNK
Please input blue cells		Version 0.2 June 2021
IMO Number	1111111	
Ship Name	NK bulker	
Ship Type	Bulk carrier	
Deadweight	61338	
Gross Tonnage		
Diesel/ Gas Oil	563	
LFO		
HFO	3580	
LPG(Propane)		
LPG(Butane)		
LNG		
Methanol		
Ethanol		
Distance Travelled (nm)	54289	
CO2 Emission	12953	
Attained CII	3.89	
CII ref	4.99	
Rating Year	2023	
Required CII	4.74	
Attained CII / Required CII	0.820	
CII Rating	A	

Fig. 9 CII simple assessment tool

## 4. CLASSNK ZERO-EMISSION TRANSITION SUPPORT SERVICES

ClassNK has developed “ClassNK Zero-Emission Transition Support Services” so that customers involved in the maritime transportation business can pursue zero emissions while carrying out planning and management of GHG emissions in their everyday business operation.

As the actual menu of services, ClassNK has arranged and provides a comprehensive range of support services that includes the GHG emissions management systems development & certification, GHG emissions management tools, GHG emissions verification & assessment and GHG emissions reduction support (Fig. 10). This chapter introduces the outline of these support services.

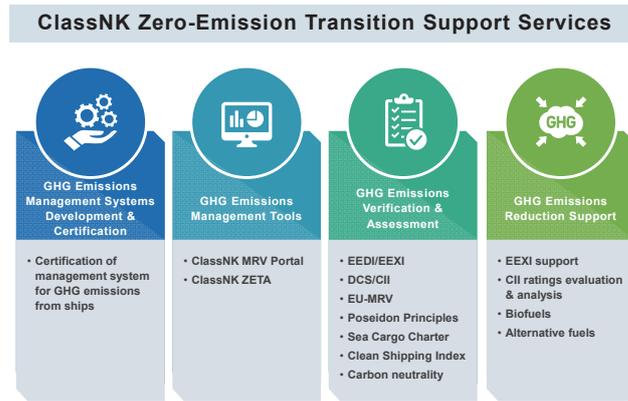


Fig. 10 ClassNK zero-emission transition support services

#### 4.1 GHG Emissions Management Systems Development & Certification

ClassNK certifies the proactive efforts of concerned parties that set a clear target for reduction of GHG emissions from ships, develop appropriate management systems for its achievement and operate the management system.

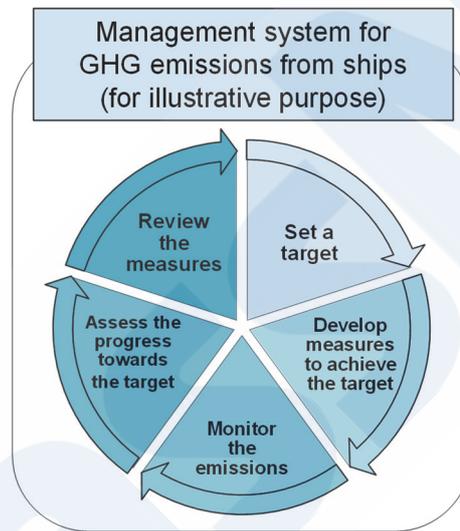


Fig. 11 Management system for GHG emissions from ships (image)

To manage GHG emissions from ships in a planned manner, it is considered necessary to continue the cycle of setting a clear target for the reduction of GHG emissions from the ship, studying measures for achievement of that target, determining the actual GHG emissions and evaluating the target achievement level and reviewing measures (Fig. 11).

ClassNK expects that the acquisition of this certification will add further value to the future maritime transportation business of those concerned.

This certification will be conducted within the framework of Innovation Endorsement (IE), which ClassNK has operated since 2020 as a certification service to support innovative efforts by concerned parties.

#### 4.2 GHG Emissions Management Tools

As described above, ClassNK provides the ClassNK MRV Portal to enable ship companies to respond efficiently to the IMO-DCS and EU-MRV regulations. The Society released ClassNK ZETA (Zero Emission Transition Accelerator) in April 2022 as a GHG emissions management tool linked to the ClassNK MRV Portal (Fig. 12). This tool is a comprehensive data management platform equipped with a function for monitoring the CO<sub>2</sub> emissions of individual ships or an entire fleet and the CII rating, which will be introduced in 2023. The Society has also constructed a framework that enables ship owners and charterers to safely use data with the permission of the data owner, namely, the ship management company providing CO<sub>2</sub> emissions data, by utilizing the mechanism of IoS-OP.

ClassNK ZETA is equipped with the following four functions, primarily for ship management companies, ship owners and

charterers.

- A Vessel Monitoring function that displays the CO<sub>2</sub> emissions, result of the CII rating, etc. of individual ships in real time.
- A Fleet Monitoring function that displays the entire fleet's CO<sub>2</sub> emissions, result of the CII rating, etc. in real time.
- A Simulation function for simulating the changes in CO<sub>2</sub> emissions and the CII rating by slow steaming and other possible measures.
- A Periodical Report function that can output the CO<sub>2</sub> emissions for each voyage, ship or fleet.

Development is underway to also respond to requirements such as reporting of CO<sub>2</sub> emissions between the ship company, financial institutions and charterers, with the aim of responding to frameworks such as the Poseidon Principles and the Sea Cargo Charter, with the aim of providing a platform that enables stakeholders to check and determine the necessary CO<sub>2</sub> emissions of ships at the necessary time, with appropriate agreement among the stakeholders.



Fig. 12 Image of ClassNK ZETA

### 4.3 GHG Emissions Verification & Assessment

#### 4.3.1 Response to IMO and EU Regulations

As a ship classification society, ClassNK conducts checks to verify compliance with IMO regulations such as EEDI and SEEMP, which were started in 2011. In addition to verification of compliance with the new EEXI regulation and CII rating described in Chapters 2 and 3, ClassNK also intends to strengthen its support related to those efforts.

In the EU, the EU-MRV regulation was started in 2018 and requires collection and reporting of fuel consumption and other data for voyages departing from and arriving in ports in areas under the jurisdiction of the EU. ClassNK has also performed certification of approximately 3,500 cases as a certification body for this regulation.

Because the United Kingdom withdrew from the EU, a regulation called UK-MRV, which is similar to EU-MRV, was introduced separately in January 2022 for voyages departing from and arriving in the UK. ClassNK is currently working to acquire certification as a certification body for UK-MRV. Since the data that must be collected for UK-MRV can be extracted from the data that ClassNK currently collects for EU-MRV, ClassNK is currently carrying out work to improve the ClassNK MRV Portal in order to respond to this function.

#### 4.3.2 Response to Private Sector-Led Frameworks

In addition to the regulations introduced by the IMO and Europe, movements toward accelerating the reduction of GHG emissions from ships are also spreading at the private sector level.

In June 2019, the Poseidon Principles was launched as a framework for promoting the reduction of CO<sub>2</sub> emissions from international shipping from the standpoint of financial institutions. Financial institutions which sign the Poseidon Principles are required to evaluate to what extent the CO<sub>2</sub> emissions of their ship finance portfolio is aligned with the IMO's GHG target (minimum 50% reduction of total GHG emissions from international shipping from 2008 to be achieved by 2050), and disclose the results every year.

Similarly, in October 2020, the Sea Cargo Charter was launched as a framework for promoting the reduction of CO<sub>2</sub> emissions from international shipping from the standpoint of charterers. Charterers and shipping companies signing the Sea Cargo Charter are required to evaluate to what extent the CO<sub>2</sub> emissions from their cargo transportation is aligned with the IMO's GHG target (minimum 50% reduction of total GHG emissions by 2050), and disclose the results every year.

In December 2021, the Poseidon Principles for Marine Insurance was also launched as a framework for promoting the

reduction of CO<sub>2</sub> emissions from international shipping from the standpoint of marine insurance. Insurance companies signing the principles are required to evaluate to what extent the CO<sub>2</sub> emissions from ships for which they undertake insurance is aligned with the IMO's GHG target (minimum 50% reduction of total GHG emissions by 2050), and disclose the results every year. However, while the above-mentioned Poseidon Principles and the Sea Cargo Charter only require evaluation for consistency with the present IMO's GHG target, the Poseidon Principles for Marine Insurance is characterized by also requiring evaluation for consistency with the 2050 zero-emissions goal.

ClassNK provides assessment services based on these frameworks.

#### 4.3.3 Evaluation for the Achievement of Carbon Neutrality

As climate change is gaining more and more attention on a global scale, companies are increasingly setting their ambitions to achieve carbon neutrality by 2050.

For ship companies that set targets for reduction of CO<sub>2</sub> emissions from their ships, for example, a target of achieving carbon neutrality in 2050, ClassNK will evaluate the degree to which the CO<sub>2</sub> emissions from their fleets conforms to the set target. In this assessment, the CO<sub>2</sub> emissions to be targeted or the year of achievement can be customized according to the request of the ship company. ClassNK also plans to support lifecycle CO<sub>2</sub> emissions of fuels and use of the carbon offset scheme.

#### 4.4 GHG Emissions Reduction Support

Although support by ClassNK for measures to reduce GHG emissions from ships was described in Chapters 2 and 3, the Society is also actively providing support for the introduction of alternative fuels.

Decarbonization of ships is currently in the transition phase, and it is thought that the adoption of zero-emission fuels will increase in the future. To facilitate the introduction of alternative fuels, ClassNK issued “Guidelines for Ships Using Alternative Fuels” (Edition 1.1) in September 2021. The guidelines consist of the existing “Guidelines for Ships Using Low-Flashpoint Fuels (Methyl/Ethyl/Alcohol/LPG)” and newly-added provisions for ships using ammonia as a fuel, and have a comprehensive content that includes the safety requirements for these fuels. Furthermore, ClassNK has also updated the notation for the existing “LNG Ready,” and has added provisions concerning design in preparation for the future use of these alternative fuels and “Alternative Fuel Ready” as a notation for ships with partial equipment installation.

ClassNK also provides support for the use of biofuels. Biofuels are renewable fuels that are produced from biomass, mainly plant oil, as the raw material. Although these fuels emit CO<sub>2</sub> during combustion, because the plants (biomass) used as the raw material absorb CO<sub>2</sub> in the atmosphere in their growth process, biofuels are regarded as “carbon-neutral” fuels. Some types of biofuels have the advantage of serving as “drop-in fuels” which can be used as fuels for ships without changing the specifications of existing diesel engines, and are also being used in ships on a trial basis in a growing number of cases. To assist in understanding the use of biofuels, ClassNK responds to various inquiries, and also provides explanatory materials on biofuels on ships on its website.

## 5. CONCLUSION

Following the adoption of the Paris Agreement in December 2015, the IMO adopted its initial strategy on the reduction of GHG emissions in April 2018, and laid out a goal of reducing total GHG emissions from international shipping by 50% from 2008 to be achieved in 2050. This strategy will be reviewed every 5 years. While the next revision will be in 2023, IMO started study toward this revision in the autumn of 2021. Among global efforts to reduce GHG emissions, currently more than 120 countries and region have declared their intentions to achieve carbon neutrality in 2050. In view of these trends, it is also possible that studies toward reduction of GHG emissions from international shipping will proceed based mainly on the opinion that the reduction target should be raised to “carbon neutrality in 2050.”

This paper introduced the outlines of the “EEXI regulation” and the “CII rating”, which will be introduced in 2023, and ClassNK’s response to those initiatives, as well as the outline of “ClassNK Zero-Emission Transition Support Services”.

We hope that this paper will be of assistance when considering further efforts toward the reduction of GHG emissions in the maritime shipping industry.

## REFERENCES

- 1) Resolution MEPC.328(76), 2021 Revised MARPOL Annex VI.
- 2) Resolution MEPC.333(76), 2021 Guidelines on the method of calculation of the attained Energy Efficiency Existing Ship Index (EEXI).
- 3) Resolution MEPC.335(76), 2021 Guidelines on the shaft/engine power limitation system to comply with the EEXI requirements and use of a power reserve.
- 4) Resolution MEPC.336(76), 2021 Guidelines on operational carbon intensity indicator and the calculation methods (CII Guidelines, G1).
- 5) Resolution MEPC.337(76), 2021 Guidelines on the reference lines for use with operational carbon intensity indicators (CII reference line guidelines, G2).
- 6) Resolution MEPC.338(76), 2021 Guidelines on the operational carbon intensity reduction factors relative to reference lines (CII reduction factors guidelines, G3).
- 7) Resolution MEPC.339(76), 2021 Guidelines on the operational carbon intensity rating of ships (CII rating guidelines, G4).