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DEVELOPMENT OF A SAFETY REGULATORY FRAMEWORK TO SUPPORT THE REDUCTION OF GHG EMISSIONS FROM SHIPS USING NEW TECHNOLOGIES AND ALTERNATIVE FUELS

Revision of the Code of Safety for Nuclear Merchant Ships

Submitted by Republic of Korea, United States, IACS, ICS, RINA, ITF and WNTI

SUMMARY

Executive summary:	The Code of Safety for Nuclear Merchant Ships, adopted in 1981, is outdated and a barrier to positive technology developments. The Code needs revision to establish relevant international standards to guide development and allow for timely deployment of advanced reactor technologies that could power zero-emission ships.
Strategic direction, if applicable:	3
Output:	3.8
Action to be taken:	Paragraph 15
Related documents:	Resolution A.491(XII); MSC 108/20, MSC 108/INF.21, MSC 108/WP.8 and MSC 109/WP.9/Add.1

Introduction

1 MSC 109 established a Working Group to continue efforts on the "Development of a Safety Regulatory Framework to Support the Reduction of GHG Emissions from Ships Using New Technologies and Alternative Fuels". This Working Group further refined criteria for the assignment of work to relevant sub-committees.

2 Taking into consideration the draft criteria developed by the MSC 109 Working Group, this document proposes the Code of Safety for Nuclear Merchant Ships (the Nuclear Code) be updated and outlines key elements for consideration in establishing the priority and timeline of this effort.

Background

3 MSC 107, in the biennial agenda for 2024-2025 of the Committee, agreed to include a continuous output on "Development of a safety regulatory framework to support the reduction of GHG emissions from ships using new technologies and alternative fuels". The Committee serves as the coordinating organ for relevant sub-committees conducting this work.

4 Chapter VIII of the International Convention for the Safety of Life at Sea, 1974 *(*SOLAS chapter VIII*)* gives basic requirements for nuclear-powered ships. In 1981, Assembly resolution A.491(XII) adopted the Nuclear Code and invited all concerned Governments to take appropriate steps to give effect to the Nuclear Code, and to apply the Nuclear Code as a supplement to the requirements of SOLAS chapter VIII.

5 The Nuclear Code is a guide to Administrations on the internationally accepted safety standards for the design, construction, operation, manning, maintenance, and decommissioning of nuclear-powered merchant ships. Since its adoption in 1981, the Nuclear Code has not been widely used, leaving very limited experience with its application. Further, the Nuclear Code, in its current form, is not suited to support the introduction of commercially owned and operated nuclear-powered merchant ships to the global fleet.

6 Resolution A.491(XII) recognizes that the "technology for nuclear powered ships is evolving" and authorizes the Maritime Safety Committee to "amend the Code in due course as necessary in the light of future development in the field of nuclear-powered merchant ships". Resolution A.491(XII) also contains provisions for review of the Nuclear Code (clause 1.6).

Priority of the review of the Nuclear Code

7 The Nuclear Code has not been reviewed or amended since its adoption in 1981. Comprehensive revisions and updates to the Nuclear Code are needed to reflect and accommodate over four decades of progress in both maritime and nuclear safety and security standards, as well as relevant developments in technology.

8 The Nuclear Code is currently limited to prescriptive requirements for ships using early designs of pressurized water reactor (PWR) technology and a direct steam cycle propulsion system. Although PWR technology is well proven and has an exemplary safety record at sea, it is not applied on merchant ships operating internationally, primarily due to large emergency planning zone (EPZ) requirements for highly pressurized reactors, preventing commercial insurance and port access. Over 160 nuclear-powered ships are in operation today; however, these are mostly naval ships and state-owned icebreakers, underwritten by the country of origin.

9 Progress in the design of a new generation of advanced reactor technologies and the development of all-electric-ship concepts have created the potential for successful applications of new nuclear technologies suitable for commercial marine applications. For example, reactors are being developed that incorporate inherent passive safety features and low operating pressures, resulting in a small EPZ, allowing commercial insurance for nuclear-powered ships. Additionally, some designs include longer fuel cycles that will reduce or eliminate refuelling and handling of nuclear waste in ports.

10 A group of experts on nuclear reactor technology and safety standards at the World Nuclear Transport Institute (WNTI) completed a thorough gap analysis of the Nuclear Code to demonstrate how it may be revised to be applicable to nuclear-powered ships. The gap analysis is available in document MSC 108/INF.21 (WNTI). It identifies that the Nuclear Code adopted a prescriptive approach to defining safety requirements, instead of the now widely practiced goal-setting approach to safety requirements. The analysis also identifies that the Nuclear Code should accommodate emerging technologies and be technology neutral, as opposed to prescribing PWR technology and a direct steam cycle propulsion system. The analysis provides a framework for revising the Nuclear Code that is consistent with current goal-based approaches, and follows a non-prescriptive, technology-neutral approach. The analysis also considers the nuclear safety requirements given in current International Atomic Energy Agency (IAEA) Safety Standards, International Commission on Radiological Protection recommendations, and SOLAS.

11 The GHG Working Group at MSC 109 revised the list of alternative fuels and technologies (MSC 109/WP.9, annex 1). The current list recognizes that the Nuclear Code is out of date and in need of revision. Further, it highlights that the Nuclear Code presents a barrier to the deployment of new types of reactors and power conversion systems due to specifications for PWR technology and direct steam cycle propulsion systems.

12 A new generation of marine-appropriate nuclear reactors are under development and expected to be available to the market by approximately 2030. Significant investments have been made in nuclear development by maritime stakeholders, including shipowners who recognize the need for zero-emission ships. An appropriate regulatory framework should be in place to allow ships the use of these new technologies as they become available.

13 The co-sponsors believe that the revision and update of the Nuclear Code and SOLAS chapter VIII is a high priority. Criteria for prioritizing work on regulatory barriers and gaps in the use of alternative fuels and new technologies have been developed by the GHG Working Group at MSC 109 and are expected to be considered for implementation by the Committee at MSC 110 (MSC 109/WP.9/Add. 1, annex 1). These criteria include giving priority to the removal of regulatory barriers, prioritizing the absence of regulation associated with emerging technology, considering stakeholder demands, and the time needed to complete required work and obtain adoption of amendments to IMO instruments. The current state of existing and emerging nuclear technology, the need to remove barriers to its development, and the highly technical nature of the work are directly aligned with these criteria.

Proposals

14 The co-sponsors invite the Committee to:

.1 agree that revisions to the Nuclear Code should be a high priority in the Committee's efforts to reduce GHG emissions from ships;

.2 assign the SDC Sub-Committee, starting with SDC 12 in 2026, revisions to the Nuclear Code and consideration of relevant amendments to SOLAS chapter VIII;

.3 coordinate input from other relevant sub-committees, as necessary, during the revision process; and

4. encourage interested Member States and international organizations to submit proposals to the SDC Sub-Committee related to this work.

Action requested of the Committee

15 The Committee is invited to consider the information provided in this document and the proposals outlined in paragraph 15 above and to take action, as appropriate.