INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON SHIP DESIGN AND CONSTRUCTION
12th session
Agenda item 9

SDC 12/9/4
14 November 2025
Original: ENGLISH
Pre-session public release: ☒

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

Proposed road map, method of work and amendment to the revision of the Code of Safety for Nuclear Merchant Ships (resolution A.491(XII))

Submitted by France

SUMMARY

Executive summary:	This document provides proposals to initiate the revision of the Code of Safety for Nuclear Merchant Ships (resolution A.491(XII)) within a dedicated framework and appropriate timeline.
Strategic direction, if applicable:	3
Output:	3.8
Action to be taken:	Paragraph 23
Related documents:	MEPC 108/INF.21; MSC 109/WP.9/Add1; MSC 110/21 and MSC 110/WP.9

Introduction

1 MSC 110 approved in its entirety the recommendations of the Working Group established at that session following the work of the Correspondence Group on the Development of a Safety Regulatory Framework to Support the Reduction of GHG Emissions from Ships Through the Use of New Technologies and Alternative Fuels (MSC 110/21, paragraph 6.49).

2 Accordingly, the SDC Sub-Committee was instructed (MSC 110/21, paragraph 6.58) to consider the tasks listed in annex 5 to document MSC 110/WP.9, which cover nuclear energy, wind propulsion, lithium-ion batteries and swappable traction lithium-ion battery containers. In addition, in the same document, it was also recommended that Member States and interested international organizations submit relevant documents to it for consideration (MSC 110/WP.9, paragraphs 26 and 27).

3 The recommended tasks should be examined by the SDC Sub-Committee in accordance with the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies*

(MSC-MEPC.1/Circ.5/Rev.6) when defining the scope of the relevant outputs. The Committee instructed the Sub-Committee to develop a comprehensive work plan to assess gaps and obstacles and to identify the instruments that might, where appropriate, need to be amended, with a view to seeking suitable guidance from the Committee before preparing such amendments (MSC 110/21, paragraph 6.54).

Discussion

4 With regard to nuclear energy, the Committee expressed its support for updating the Code of Safety for Nuclear Merchant Ships (resolution A.491(XII) Nuclear Code) in order to take account of the technological progress achieved since the entry into force of the Code in 1981. It is noted that that the Correspondence Group stressed the urgency of revising the Nuclear Code, having nevertheless considered that the planning of this revision must take into account the realities of technological development and the time required for the availability of technologies suited to nuclear propulsion in the merchant fleet, as well as the task-prioritization criteria approved by the Committee.

5 It should be recalled that the Committee, for all alternative propulsion means, approved (MSC 110/21, paragraph 6.4) the criteria to be applied when allocating tasks to sub-committees, as set out in annex 1 to document MSC 109/WP.9/Add.1. One criterion calls for consideration of "the existing workload of a sub-committee before assigning a new task", and two others make recommendations on the prioritization of tasks:

.1 "Consider prioritizing tasks based on demand by stakeholders (e.g. current projects/requirements, etc.)"; and

.2 "Consider prioritizing tasks that address alternative fuels or technologies already in use onboard ships".

6 It is noted the embryonic stage of projects associated with nuclear propulsion and emphasized that the need to demonstrate their safety level and compatibility with maritime transport requirements remains outstanding. At this stage, a greater weight should be given to criterion 5.2 above in the prioritization process to be undertaken.

7 In addition, it is observed, that despite the adoption of the non-mandatory Nuclear Code (which theoretically allows some flexibility to Administrations), the development of civil maritime nuclear power has remained restricted for many reasons. It has only been implemented by about half a dozen States and only through State-controlled structures.

8 Furthermore, it is emphasized that the current state of development and availability of the nuclear fuel cycle industrial facilities required for the various technologies must also be taken into account in the deliberations. The definition of the work plan for the sub-committee responsible for revising the Nuclear Code must, therefore, take into account the level of maturity of the various technologies and the availability of the associated industrial resources.

9 Objectively, when the Sub-Committee comes to review its workload and its biennial agenda, the question of the priority to be given to the revision of the Nuclear Code among the tasks entrusted to it by MSC 110, compared with other technologies, will have to be considered, in particular in light of the likely availability timelines. France calls for transparency regarding the deployment of associated projects, for example under the Future Fuel and Technology Project which already publishes orders for vessels designed to use several alternative fuels (hydrogen, ammonia, LNG, methane/ethane), and the data published by IWSA (https://www.wind-ship.org/market-intelligence/).

10 It is stressed the need for the revised Nuclear Code, applicable to all reactor technologies, to ensure the level of safety expected by competent authorities, and the need to build the mutual confidence required among Member States to allow nuclear-powered merchant ships to enter their territorial waters and ports.

11 MSC 110 also approved the recommendation to pursue a "goal-based and/or prescriptive approach as deemed appropriate" (MSC 110/WP.9, annex 1). It is recalled that the 1981 Nuclear Code was established according to a prescriptive approach. In the case of ships crossing international boundaries and subject to diverse legal environments, they recommend, so as to avoid interpretative inconsistencies, maintaining this prescriptive approach as far as possible and updating it to reflect the most current and demanding IAEA standards and the expertise of national nuclear-safety authorities. Adopting such an approach requires a sufficiently precise understanding of the underlying concepts and will, therefore, only be possible once the technologies are mature and proven ashore.

12 While fully supporting innovation, it is considered that the approach adopted should enable the deployment of all technologies. This prescriptive approach should, therefore, apply to each technology, including the most innovative. This will undoubtedly be an advantage for ensuring uniform application and will reduce the administrative burden for certifying bodies and approving States, which are conditions essential to the successful development of promising new technologies.

13 Moreover, it is considered that only technologies that have been proven ashore could, where appropriate, be eligible for use on merchant ships. It is further believed that this would strengthen public acceptability.

14 In planning the work for the revision of the Nuclear Code, realistic consideration should be given to the projected deployment of new nuclear technology, in comparison with other alternative propulsion technologies. As availability timelines differ greatly from one technology to another, a gradual approach is recommended. Thus, the Nuclear Code could first be updated to incorporate current safety standards, and subsequently the specific safety requirements of emerging technologies that have reached a sufficient level of maturity.

15 When examining the issue of the safety of nuclear-powered merchant ships and floating nuclear power plants (MSC 110/21, paragraphs 20.10 to 20.13), the need for inter-agency cooperation on these matters (IMO/IAEA) was highlighted by the Committee. The Secretariat confirmed its effective cooperation with that of IAEA. However, it was noted that Member States would not participate directly in those discussions. In addition, early involvement of national nuclear-safety authorities and maritime Administrations is considered an essential pre-requisite for any revision of the civil nuclear-propulsion regulatory framework and for updating the Nuclear Code.

16 International commercial navigation involving nuclear reactors, whether as a means of semi-direct propulsion or as an energy source, will need to be based on a common reference framework ensuring, first and foremost, a high and clearly defined level of safety. This framework, which will not be limited to resolution A.491(XII) alone, must also ensure methodological consistency in the authorization process for navigation, in order to avoid recurring interpretative difficulties for flag States, as well as coastal and port States. This implies uniform application of that framework throughout the stages of design, construction, approval by the installer, operation, decommissioning, nuclear waste management and ship recycling. This is all the more important as the instrument will initially remain of a non-mandatory nature.

17 With the above in consideration, it would be both inconsistent and premature to proceed with a revision of the Nuclear Code (unchanged since 1981). Such a revision would have to take into account the technological advances and standards developed by IAEA since that date, without being linked to the forthcoming ATLAS initiative to be launched by IAEA.

18 Within the framework of its mandate and with a "safety" approach, the Working Group established under MSC, reporting to MSC 110 the conclusion of its findings (MSC 110/WP.9), did not identify, in respect of nuclear propulsion, any additional regulatory gaps or shortcomings that have hindered the development of this technology.

19 However, many regulatory aspects that fall within the Organization's scope remain to be considered: crew training, insurance, liability, legal aspects related to the identification of owners and licence holders, pollution prevention, medical monitoring and aptitude of seafarers, inspection and controls, reactor decommissioning and ship recycling, etc.

20 Furthermore, the expertise provided solely by the members of the Sub-Committee would hardly be sufficient to make progress on these aspects, which fall within the remit of other IMO bodies (LEG, FAL, MEPC, HTW, III) or other organizations (IAEA, ILO, WHO). It is, therefore, suggested that a formal inter-organizational working group (IMO/IAEA JWG) be established in order to ensure a comprehensive regulatory approach, particularly with a view to identifying the gaps and shortcomings that hinder the development of civil nuclear technology.

21 For all the reasons mentioned above, it is considered that the urgent advancement (that is, within the 2026–2027 biennium) of the revision of the Nuclear Code by the Sub-Committee alone would not be prudent and may prove ineffective, even though this technology has been identified as one of the potential solutions for achieving the objectives of the decarbonization strategy.

Proposals

22 In order not to delay the work of revising the Nuclear Code, while taking into account the elements set out above, it is, therefore, proposed:

.1 to assess the priority to be given to the revision of resolution A.491(XII) on the basis of objective and transparent criteria relating to the prospects for the development of nuclear propulsion technologies, and in light of the criteria approved by MSC 110;

.2 to take note of the need to maintain a prescriptive approach, in order to uphold the principles set out in paragraphs 11 to 13, and to incorporate the expertise of national nuclear safety authorities;

.3 to consider the revision of resolution A.491(XII) within a timeframe consistent with that of IAEAs ATLAS initiative when drawing up its work plan;

.4 to propose that MSC 111 consider the formal establishment of a joint IMO/IAEA working group, allowing both active participation by interested Member States and by national nuclear safety authorities in the work on civil nuclear propulsion and, possibly in the future, on floating nuclear power generation units (MSC 110/21, paragraph 18.87); such a group could also usefully involve other IMO bodies besides MSC (LEG, FAL) in order to ensure a holistic regulatory approach;

.5 to consider a stepwise revision of the Nuclear Code, in line with the projected schedule for the availability of the relevant technologies;

.6 in application of the principles set out in paragraphs 10 to 13, to revise the Code according to an incremental approach, as follows:

.1 At a first stage, the structure of the Code would be revised into two parts:

.1 a first part aimed at defining the safety requirements applicable to any onboard nuclear reactor, regardless of its technology. In addition to setting out the fundamental principles, this part would specify the external hazards specific to the integration of a reactor on a merchant ship and to the marine environment, thereby complementing those applicable to a land-based reactor;

.2 a second part, essentially prescriptive in nature, which would set out detailed safety requirements for proven technologies and specify the technical requirements to be verified, taking into account operational feedback. This stage would initially concern only pressurized water reactors.

.2 At a second stage, the prescriptive part of the Code would be updated based on the evolution of technologies whose safety has been demonstrated. This could be the case, for example, for molten salt reactors, once their development has made it possible to produce land-based prototypes confirming the design choices and their high level of safety; and

.7 to invite interested Member States having experience in operating, or hosting in their ports, nuclear-powered ships to share their feedback and lessons learned from safe operational experience.

Actions requested of the Sub-Committee

23 The Sub-Committee is invited to consider the comments in paragraphs 4 to 21 and the proposals set out in paragraph 22, and to take such action as it may deem appropriate.

***

ANNEX

PROPOSAL FOR A NEW NUCLEAR CODE STRUCTURE

Part I – General safety objectives

- Purpose
- Definitions
- General safety principles
- Specific external hazards
- …

Part II – Design-specific safety requirements

- **Section "proven technologies"**
  - **…**
  - **…**
- **Section "new technologies"**
  - **…**
  - **…**