

# Investigation of Nuclear Ship Related Legislations and Recommendations for Legal Framework Establishment

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## 1. Introduction

Carbon dioxide emissions from ships worldwide already account for three percent of global emissions. The International Maritime Organization (IMO) has set a goal to reduce carbon dioxide emissions by half from the 2008 levels by 2030. Additionally, in July of 2023, the IMO, based in London, plays a crucial role in providing and promoting the highest level of practical standards for the prevention and control of pollution from ships and ensuring maritime safety and efficient navigation.

Therefore, research on environmentally friendly ships using renewable energy sources is underway. However, there are limitations to using renewable energy sources, as ensuring the output of energy used as a power source is essential for the stable operation of ships.

Nuclear ships present not only a response to global carbon-zero objectives but also offer advantages such as fuel cost reduction during navigation and resolution of conflicts between surrounding areas due to onshore power plant sites. Therefore, the widespread adoption of nuclear ships seems imminent, driven by high demand resulting from their benefits.

This study delves into the legal aspects of nuclear ships in Korea, considering their potential as a new market. Comparative analysis is performed with a foreign law, focusing on the legal framework in the United Kingdom. In conclusion, the study provides suggestions for legal amendments in Korea concerning nuclear ships and reflects on the direction of these proposed changes.

## 2. Comparison of Laws for Nuclear Ships

### 2.1 Domestic Law for Nuclear Ships

There are two types of nuclear ships: those using nuclear power as the propulsion system and those in the form of offshore floating structures used for electricity generation.

In Korea, regulations regarding nuclear-powered ships are primarily divided into two laws: The Ship Safety Act and the Nuclear Safety Act.

In the Ship Safety Act, it states the reactor included in nuclear-powered ships is defined as a nuclear facility constituting a part of the Ship's Facilities [1].

According to Article 2 of Chapter 1 of the Ship Safety Act, ships are defined to include "navigational" and "floating offshore structures." It seems the law includes floating nuclear reactors but it is important to note that the law does not consider floating nuclear reactors for electricity. Because the regulations regarding floating structures related to nuclear matters are those containing radioactive materials such as used nuclear fuel, plutonium, and radioactive waste [2]. Therefore, floating nuclear reactors that commonly used for electricity production would not fall under this definition.

This limitation for the application is also found in a special notification for the Nuclear Ship Standards [3]. According to Article 8 (Inspection and Certificate) of the Nuclear Ship Standards, it states for nuclear passenger ships and nuclear cargo ships only. Therefore, the nuclear ship law applies only to passenger and cargo ships intended for navigation, not to floating nuclear reactors.

Also as stated in Article 3, the scope of application of this law is limited to "ships owned by Korean nationals or owned by the Korean government."

Regarding foreign nuclear-powered ships, regulations are separately specified in the Article 31 of Nuclear Safety Act [4]. This article regulates "foreign nuclear-powered ships" intending to enter or depart from South Korean ports. And the regulation details are provided in Article 31 (Declaration of Entry and Exit of Foreign Nuclear Ships) of the Nuclear Safety Act, but there is no mutual reference to the Entry and Exit Regulation Act in Ship Safety Act.

In accordance with Article 3 in the Ship Safety Act, it states that all foreign ships must comply Article 68 (Port State Control), but it does not specify requirements for entry and departure declarations of the nuclear-powered vessels.

Interestingly, the Nuclear Safety Act designates the Minister of Oceans and Fisheries as both the reporting authority and approval authority. For consistent flow, Nuclear Safety Act to nuclear-powered ships needs to apply and aligned with the Ship Safety Act. And new research on radiation risk assessments during ocean-

based activities is required and should be proposed as guidelines.

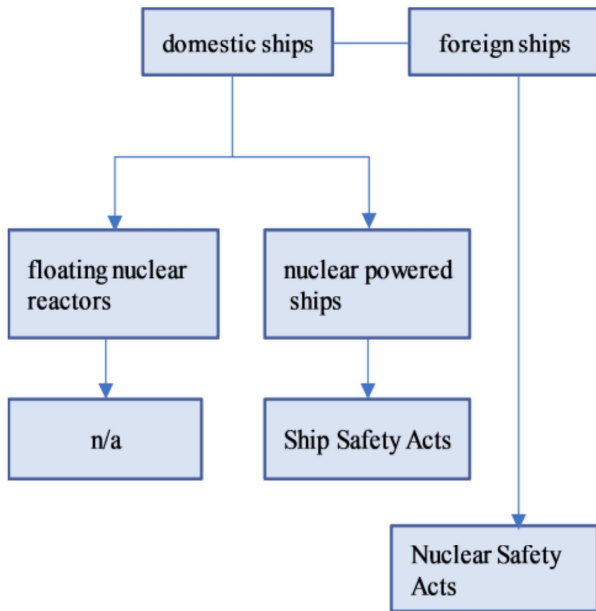


Fig. 1. Classification of Korean legislation according to types of nuclear ships

In summary, under domestic law, there is a distinction between domestic nuclear ships and foreign nuclear ships as shown in Fig 1. For domestic nuclear ships, the Ship Safety Law is applicable, but there is no specific maritime regulation for floating nuclear reactors. Regarding foreign nuclear ships, regulations for entry and exit are specified in the Nuclear Safety Act, while there is no provision in the Entry and Exit Regulation Act.

## 2.2. Current Regulatory Approval Process for Nuclear Powered Ships

Ships registered with classification societies shall be deemed to have passed the ship inspection under Ship Safety Act only for ship facilities and cargo loading and unloading facilities specified by the Ministry of Oceans and Fisheries.

As mentioned section 2.1, reactor is defined as a nuclear facility constituting a part of the Ship's Facilities, the nuclear powered ships are also considered included in this law.

Thus, ship inspections must adhere to the regulatory requirements and standards set forth in the law. However, Article 66 of the Ship Safety Act grants inspections and certificates issued by recognized agencies (such as classification societies) according to the standards of foreign ships.

Article 7, Construction Inspection states that regarding construction inspections, ship inspections must be conducted before construction in accordance with shipbuilding facilities, but it also states that delegation to classification societies or designated separate agencies is permitted.

Additionally, it states that technical review matters can be delegated to classification societies or public corporations by the Minister of Oceans and Fisheries and approval by classification societies is considered appropriate.

## 2.3 UK Laws Related to Nuclear-Powered Ships

The fundamental legislation governing nuclear-powered ships in the United Kingdom is the Merchant Shipping (Nuclear Ships) Regulations 2022 [5]. This regulation adopts Chapters I (General Provisions) and VIII (Nuclear Ships) from the International Maritime Organization's (IMO) SOLAS Annex to the Convention, similar to The Ship Safety Act in Korea. But the distinction is that the UK law incorporates a detailed guide referred to as the IMO Resolution A.491(XII), 1981, known as the Nuclear Ships Code additionally, through a Marine Guidance Note (MGN).

The UK law highlights the cases when Nuclear Installations Act to be applied for the nuclear ships and the role of the Office for Nuclear Regulation (ONR).

The law emphasizes that if the construction of nuclear facilities entering nuclear-powered ships is conducted on land, it requires approval in the form of a "Nuclear Reactor Construction Permit" under the Nuclear Installations Act 1965. The law also outlines the approval stages, starting from the construction examination, which must comply with the ONR's regulatory process.

Furthermore, even in the case of floating nuclear reactors, it is noted that the Radiation Emergency Preparedness and Public Information for Response (REPPIR 2019) regulations, applied in the United Kingdom, are relevant when nuclear ships are moored alongside or when ship operations involving ionizing radiation are carried out. This indicates adherence to existing land-based nuclear regulations.

The UK law explicitly states that the regulations for nuclear-powered ships, as outlined in the Marine Guidance Note (MGN), apply not only to domestic nuclear-powered ships but also to foreign nuclear-powered ships visiting UK waters.

Overall, regarding nuclear-powered ships as "transport vehicles," the Ship Safety Act is applied, but activities such as construction, decommissioning, or operations involving floating or land-based nuclear facilities are subject to both the Ship Act and the Nuclear Installations Act as stipulated in nuclear installation act.

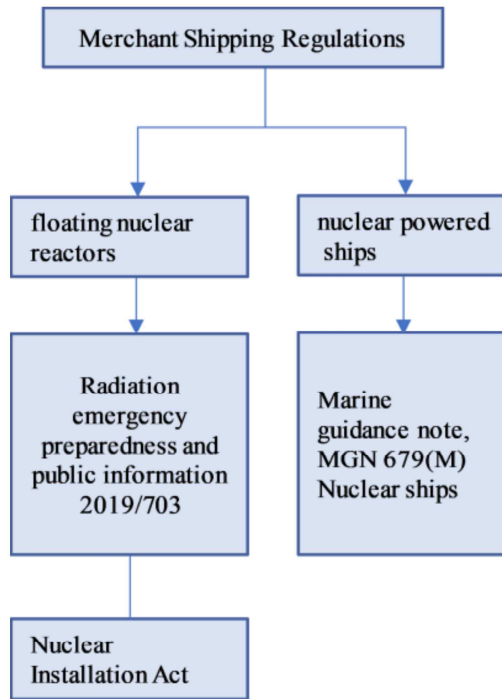


Fig. 2. Classification of UK legislation according to types of nuclear ships

In summary, nuclear ships are categorized into nuclear propulsion vessels and floating nuclear reactors or operations with radiation hazards conducted on land, which is shown in Fig 2. While both fall under the regulation of the Merchant Shipping (Nuclear Ships) Regulations, detailed guidelines are provided within the respective laws such as the Nuclear Installations Act and Radiation Emergency Preparedness and Public Information for Response Act, each tailored to their specific context.

### 3. Result

Regulations regarding nuclear-powered ships in Korea and UK are described in this study.

Laws related to nuclear-powered ships are dispersed in Korean laws between Ship Safety Acts and Nuclear Safety Acts and the laws related to nuclear ship applies only to passenger and cargo ships intended for navigation, not to floating nuclear reactors.

In UK law, nuclear-powered ships are regarded as "transport vehicles," the Ship Safety Act is applied, on the other hand, activities such as construction, decommissioning, or operations involving floating or land-based nuclear facilities are subject to both the Ship Act and the Nuclear Installations Act as stipulated in nuclear installation act.

Current regulatory approval process for nuclear powered ships grants approval by classification societies, therefore, it is natural that the national response to regulations for new nuclear-powered

vessels will be slow due to the delegation of technical review and approval by classification societies.

### 4. Conclusions

Currently, laws pertaining to ships utilizing nuclear reactors as power sources are relatively concise and challenging to apply compared to the extensive laws and regulations governing land-based nuclear reactors, such as Nuclear Safety Acts.

Furthermore, the legislation related to nuclear ships appears fragmented across two laws: the Nuclear Safety Act and the Ship Safety Act. This ambiguity makes it difficult to determine which law governs nuclear ships, thus complicating their application.

Nuclear-powered ships, although containing nuclear reactors, are vessels used as a power source for ships and should adhere to maritime safety laws in consistent manner. Also, additional legislation is to be established for floating nuclear reactors.

But treating a nuclear-powered vessel simply as another type of ship overlooks the unique complexities and safety considerations associated with nuclear propulsion, so legislation covering the entire life cycle, including construction and dismantling of nuclear-powered ships, should be studied and formulated on top of The Ship Safety Act.

The establishment of stringent safety regulations and laws specific to nuclear-powered vessels is crucial, given the potential implications for human life.

Therefore, There is a need to establish special provisions for standard application, undergo evaluation by the Nuclear Safety Commission, and collaborate with relevant ministries and institutions to supplement the content of nuclear ship related laws.

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