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FEATURES OF THE JUDICIAL PROCEDURAL SYSTEM IN NUCLEAR ENERGY

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Abstract: The article is dedicated to studying the judicial and procedural features related to nuclear energy regulation and dispute resolution within this sector. Given the high risks associated with the operation of nuclear facilities, judicial systems must consider both national legal norms and international agreements, such as the 1963 Vienna Convention on Civil Liability for Nuclear Damage. This work analyzes the legal mechanisms of civil liability for nuclear damage and compensation procedures using examples from the United States, France, Russia, and China. Special attention is paid to the involvement of experts, procedural norms, insurance issues for nuclear operators, and appeal mechanisms. Additionally, challenges in ensuring the independence of judges in cases related to nuclear incidents and the role of international cooperation in creating unified standards for nuclear safety are explored.

Keywords: Nuclear Energy, Judicial Procedural System, Civil Liability, Nuclear Damage, Vienna Convention

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Introduction

Nuclear energy holds a vital place in the energy systems of many countries, offering a stable and clean energy source. However, its use entails significant risks, such as nuclear accidents, radioactive contamination of the environment, and threats to public health. These risks necessitate strict regulation and the presence of effective legal and judicial mechanisms for resolving disputes related to nuclear activities. Judicial systems must consider not only national laws but also international norms, such as the 1963 Vienna Convention on Civil Liability for Nuclear Damage. This document was among the first international agreements to lay the foundation for regulating liability for nuclear incidents and compensating affected parties.

Over decades, many countries have developed their own legal systems, adapting international standards to their national contexts. Judicial systems regulating nuclear incidents differ in their structure and procedural features across countries. For instance, in the United States and France, there are specialized laws such as the Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act) [1] in the United States and national nuclear safety acts in France, which regulate operator liability and damage compensation procedures. In Russia and China, despite the active development of nuclear energy, there are also unique practices of legal enforcement, including close integration with international norms and substantial state influence on judicial processes.

One of the key aspects that make the judicial system in nuclear energy unique is the involvement of specialists in nuclear physics and radiation safety to analyze the technical aspects of cases concerning nuclear facility accidents. The complexity of nuclear incidents and their potentially

catastrophic consequences demand a deep understanding of not only legal but also scientific aspects. Compensation procedures must account for the specifics of radiation impact on the environment and human health, as well as the long-term consequences of nuclear accidents, which make judicial processes in this field particularly complex.

Additionally, international cooperation plays a significant role in enhancing judicial procedural systems in nuclear energy. The Vienna Convention and other international agreements, such as the Convention on Nuclear Safety, are aimed at unifying legal standards that regulate operator liability and damage compensation procedures. These treaties provide a legal foundation for harmonizing approaches to liability and mechanisms for cross-border cooperation in the case of nuclear incidents, which is especially crucial in the global nuclear industry, where accidents can have transnational effects.

Therefore, an effective judicial procedural system in the field of nuclear energy requires the integration of international norms, the presence of specialized national legal mechanisms, and the readiness of judicial bodies to address cases of high technical complexity. This article examines the legal and procedural features of regulation in this area, with case examples from the United States, France, Russia, and China, as well as the role of international treaties like the Vienna Convention.

Methods

This article utilizes a comparative legal analysis method to explore the judicial procedural systems and liability mechanisms related to nuclear energy in various countries. The study examines primary sources, including national legislative acts, international conventions (such as the 1963 Vienna Convention on Civil Liability for Nuclear Damage), and judicial cases to understand how different legal frameworks manage nuclear liability and compensation. Key countries analyzed are the United States, France, Russia, and China, chosen for their active nuclear programs and unique legal approaches.

The research involves qualitative examination of the principles and procedures underlying nuclear liability, with particular focus on aspects like strict liability, liability limitations, mandatory insurance, and extraterritorial application of laws. By analyzing legal texts and international agreements, the study assesses the effectiveness of these frameworks in handling nuclear accidents and transboundary implications. Through this analysis, the article identifies best practices and challenges in establishing an effective judicial procedural system for nuclear energy governance.

Results and Discussion

1. Legal Foundations of the Judicial Procedural System in Nuclear Energy

Judicial procedural systems in nuclear energy are based on a combination of international law, national legislative acts, and precedents. These systems provide legal regulation of issues related to nuclear facility safety, damage compensation, and dispute resolution arising from nuclear accidents. The principle of civil liability, enshrined in international treaties like the 1963 Vienna Convention on Civil Liability for Nuclear Damage [2], serves as the basis for legal regulation in most countries.

1.1 The 1963 Vienna Convention on Civil Liability for Nuclear Damage

The Vienna Convention is a fundamental international agreement that regulates the civil liability of nuclear facility operators. It establishes crucial legal principles used in the national legal systems of participating countries:

- a. **Principle of Strict Liability:** The operator of a nuclear facility is liable for damage caused by the facility's activities, regardless of fault. This simplifies the compensation process for victims by eliminating the need to prove the operator's guilt.
- b. **Liability Limitation:** The Convention allows state legislation to cap the maximum amount for which the operator is liable. If damage exceeds this limit, the state is obligated to provide compensation through national funds or other mechanisms.
- c. **Mandatory Insurance:** The Convention mandates that operators have insurance coverage or other financial guarantees for damage compensation, ensuring funds are always available for payouts.
- d. **Extraterritorial Principle:** The Convention applies not only within the state's territory but also beyond it if the damage is caused by a nuclear facility in one of the member states. This is crucial for addressing cross-border nuclear incidents.

Since the Vienna Convention's adoption, its norms have been integrated into the national legal systems of many countries, ensuring harmonization of approaches to liability and compensation in the event of nuclear accidents.

1.2 The United States

The U.S. legal system in nuclear energy is built on key legislative acts and international agreements. The foundational document is the Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act) [3], enacted in 1957 as an amendment to the 1954 Atomic Energy Act. This legislation outlines the compensation system for nuclear incident victims, establishes compensation funds, and defines government liability.

The 1954 law imposes strict liability on operators for nuclear incidents and limits their financial responsibility to a specified amount. It also mandates operator insurance and regulates the resolution process for lawsuits related to nuclear accidents, facilitating quicker compensation without lengthy legal proceedings.

1.3 France

The French legal system in nuclear energy is based on the Law on Transparency and Security in the Nuclear Field (No. 2006-686, June 13, 2006) [4] and other acts. As one of the world's leading nuclear powers, France emphasizes stringent oversight of nuclear facility activities, reflected in strict licensing and operational control requirements.

France's judicial regulation system is closely linked with the Nuclear Safety Authority (L'Autorité de sûreté nucléaire, ASN) [5], an independent administrative body that regulates nuclear safety and radiation protection on behalf of the state. Cases involving nuclear accidents and damage are reviewed by administrative courts, which apply special procedures to expedite dispute resolution. France is a signatory to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (July 29, 1960) and the 1988 Joint Protocol Relating to the Application of the Vienna and Paris Conventions [6], integrating international liability standards into its legal system.

1.4 The Russian Federation

Russia's legal system in nuclear energy is regulated by key acts like the Federal Law "On the Use of Atomic Energy" (No. 170-FZ) [7] and the Federal Law "On Radiation Safety of the Population" (No. 3-FZ). A significant feature of Russia's legal system is the stringent safety requirements for nuclear facility operation, monitored by the Federal Service for Environmental, Technological, and Nuclear Supervision (Rostekhnadzor).

Russia has signed and ratified the Vienna Convention, integrating international liability norms into national legislation. Civil courts handle cases related to nuclear accidents, though

international courts may be involved in cross-border damage cases.

1.5 China

China is actively developing its nuclear industry, necessitating a comprehensive legal system in this area. The primary legislative act is the 2017 Nuclear Safety Law [8], which regulates all aspects of nuclear facility operation, from licensing to liability for nuclear incidents. Like many other countries, China has incorporated Vienna Convention norms into its national legislation, ensuring efficient resolution of liability and compensation issues.

China's judicial system in nuclear energy relies on general administrative and civil law principles. Cases involving nuclear incidents are reviewed by specialized courts authorized to engage radiation safety and nuclear technology experts.

2. Features of Judicial Procedures

Judicial procedures in nuclear energy have several unique features due to the specific risks associated with nuclear technology, the high technical complexity of cases, and the potentially enormous consequences of nuclear facility accidents. These features require judges and lawyers to have a deep understanding of both legal and technical aspects of cases involving nuclear incidents. In various countries, these procedures are based on national legal traditions and international norms, such as the 1963 Vienna Convention on Civil Liability for Nuclear Damage, which sets common frameworks for liability and compensation.

2.1 Technical Aspects of Legal Proceedings

A key feature of judicial procedures in nuclear energy is the need to consider complex scientific and technical factors. Nuclear facility accidents involve numerous aspects, such as the level of radiation contamination, health impacts, and environmental effects. Cases in this field require expert involvement in nuclear physics, radiation protection, and ecology to provide comprehensive data on the accident's causes and consequences.

For example, in cases involving compensation for radiation exposure, experts must analyze the doses received by the victims and the subsequent health impacts. Establishing a causal link between the nuclear accident and the illnesses experienced by the victims is crucial, requiring detailed analysis of medical and radiation data. In the United States, such expert assessments are vital in cases related to claims for radiation-induced damage [9].

2.2 Standards of Evidence

Judicial procedures in nuclear energy have unique approaches to evidence standards due to the nature of nuclear risks. The strict liability principle often applies, relieving victims of the burden of proving the operator's fault. It suffices to demonstrate the fact of damage and its connection to the nuclear facility's activities, simplifying and expediting the legal process.

However, challenges can arise in proving the source of radiation and its impact on the damage, especially in cross-border nuclear incidents. Courts may face difficulties in collecting evidence, particularly when linking radiation exposure to health effects that emerge years after the incident.

2.3 Class Actions and Cross-Border Cases

Another significant feature is the possibility of class action lawsuits, especially in major nuclear accidents like Chernobyl or Fukushima. Class actions allow a large number of victims to consolidate their claims, simplifying litigation and reducing costs. In the United States, class actions are a key part of the judicial regulation system, where victims can collectively sue nuclear operators under the Price-Anderson Act.

Cross-border cases are also crucial in this field, as nuclear accidents often have international consequences. International treaties like the Vienna Convention are essential in resolving

compensation and liability issues, as seen in the Chernobyl disaster, which affected multiple countries and required cross-border cooperation [10].

2.4 Role of Specialized Courts and Bodies

Some countries have established specialized courts or tribunals to handle cases involving nuclear energy, equipped with expertise in technical and legal aspects of nuclear incidents. These bodies expedite case proceedings and improve decision quality through expert involvement and a better understanding of nuclear energy specifics. For instance, France's Nuclear Safety Authority (ASN) plays a role in proceedings related to nuclear safety violations.

In the United States, federal courts with experience in nuclear incident cases can engage experts. Russia and China also have specialized bodies overseeing nuclear safety compliance, which may be parties to judicial proceedings.

2.5 Compensation Procedures

Compensation procedures for nuclear accidents include various norms protecting victims' interests. The Vienna Convention and national laws provide compensation mechanisms for physical and moral damages, as well as health impacts. The long-term nature of compensation is vital, given the delayed health effects of radiation exposure.

Courts and specialized bodies oversee insurance payments, as nuclear operators must have insurance coverage for such cases. In the United States, the mandatory insurance system ensures prompt victim compensation without lengthy legal disputes.

3. International Aspects

International aspects of judicial procedural systems in nuclear energy play a key role in regulating nuclear liability and damage compensation, as nuclear incidents often have cross-border implications. International law and cooperation between countries aim to establish common standards applicable in various jurisdictions, especially regarding compensation for victims regardless of their nationality or place of residence. International treaties and conventions, such as the 1963 Vienna Convention on Civil Liability for Nuclear Damage, the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy, and the 1997 Convention on Supplementary Compensation for Nuclear Damage, form the basis of international legal regulation in this area.

3.1 The 1963 Vienna Convention on Civil Liability for Nuclear Damage

The Vienna Convention on Civil Liability for Nuclear Damage, adopted in 1963 under the auspices of the International Atomic Energy Agency (IAEA), is one of the key international agreements in nuclear energy. The Convention aims to ensure international cooperation on liability for nuclear incidents and compensation for victims. It establishes core principles:

- a. **Principle of Strict Liability:** The operator of a nuclear facility bears absolute liability for damage caused by a nuclear incident.
- b. **Liability Limitation:** The Convention allows participating countries to set liability limits for operators, but states must ensure additional compensation through national funds or other mechanisms if the damage exceeds these limits.
- c. **Unified Rules for All Participating Countries:** This contributes to legal certainty and consistency in international dispute resolution.

The Vienna Convention plays an important role in simplifying cross-border compensation processes, especially when victims are outside the country where the nuclear accident occurred. This helps eliminate legal barriers and conflicts between different national legal systems.

3.2 The Paris and Brussels Conventions of 1963

The Paris Convention on Third Party Liability in the Field of Nuclear Energy, adopted in

1960 under the Organisation for Economic Co-operation and Development (OECD), primarily applies in European countries. It is similar to the Vienna Convention and also enforces strict operator liability. The Paris Convention was supplemented by the 1963 Brussels Convention, which strengthened compensation mechanisms by introducing mandatory insurance payments and expanding operator liability limits.

The Paris and Brussels Conventions create a unified legal framework for European Union and OECD member states, facilitating more efficient international dispute resolution. These agreements emphasize expedited victim compensation, particularly in cross-border cases where national legal systems may face challenges.

3.3 The 1997 Protocol to Amend the 1963 Vienna Convention and the 1997 Convention on Supplementary Compensation for Nuclear Damage

The 1997 Vienna Convention amendments were developed to strengthen the existing liability mechanisms established by the Vienna and Paris Conventions. This Convention aims to create international funds for supplementary compensation in cases of major nuclear incidents. It requires member countries to contribute to an international fund used to cover damage exceeding national liability limits. The Convention also integrates countries that are not parties to either the Vienna or Paris Conventions, creating a more global network of legal mechanisms in nuclear energy. This ensures broader coverage and better dispute resolution in cases where nuclear accidents affect multiple countries.

3.4 Challenges of Cross-Border Nuclear Incidents

Cross-border nuclear incidents, such as Chernobyl and Fukushima, highlight the importance of international cooperation in nuclear law. The Chernobyl disaster in 1986 affected several countries, including Ukraine, Belarus, Russia, and numerous European states, necessitating coordinated efforts to assist victims and pay compensation. This incident underscored the need for unified legal norms and international aid mechanisms.

The Fukushima accident in 2011 also emphasized the importance of international cooperation. Although the consequences primarily affected Japan, international organizations like the IAEA provided significant support in damage assessment and compensation recommendations. The Vienna Convention and other international agreements helped accelerate the compensation process and resolve disputes between countries.

3.5 Role of the International Atomic Energy Agency (IAEA)

The IAEA plays a crucial role in coordinating international efforts to regulate nuclear liability and create legal mechanisms for dispute resolution. The IAEA not only develops international standards, such as the Vienna Convention, but also provides technical and legal assistance to countries dealing with nuclear incidents. A key aspect of the IAEA's work is developing guidelines and recommendations that help member countries effectively implement international standards in their national legal systems.

3.6 International Insurance Mechanisms

International insurance mechanisms are vital in the liability system for nuclear damage. The Vienna and Paris Conventions require nuclear facility operators to have mandatory insurance to cover damage caused by nuclear accidents. These mechanisms expedite victim compensation, especially in large-scale incidents. Insurance companies and government funds ensure that victims receive compensation even if the damage exceeds the operator's liability limits.

Conclusion

The judicial procedural system in nuclear energy is distinct due to the industry's high-risk and complex nature, requiring specialized legal mechanisms rooted in both national and international law. Strict liability, scientific expertise, and specialized bodies are essential to managing nuclear-related disputes. International conventions, like the 1963 Vienna Convention on Civil Liability for Nuclear Damage, provide a foundation for global liability and compensation standards, with countries like the United States, France, Russia, and China demonstrating alignment with these norms while adapting them locally. High-profile incidents like Chernobyl and Fukushima underscore the need for international cooperation and swift, equitable compensation mechanisms. As nuclear energy expands globally, further development of both national and international legal frameworks will be necessary, with organizations like the IAEA playing a critical role in enhancing safety, accountability, and collaboration across borders.

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