

Safety Regulation of Fusion Facilities in the Russian Federation

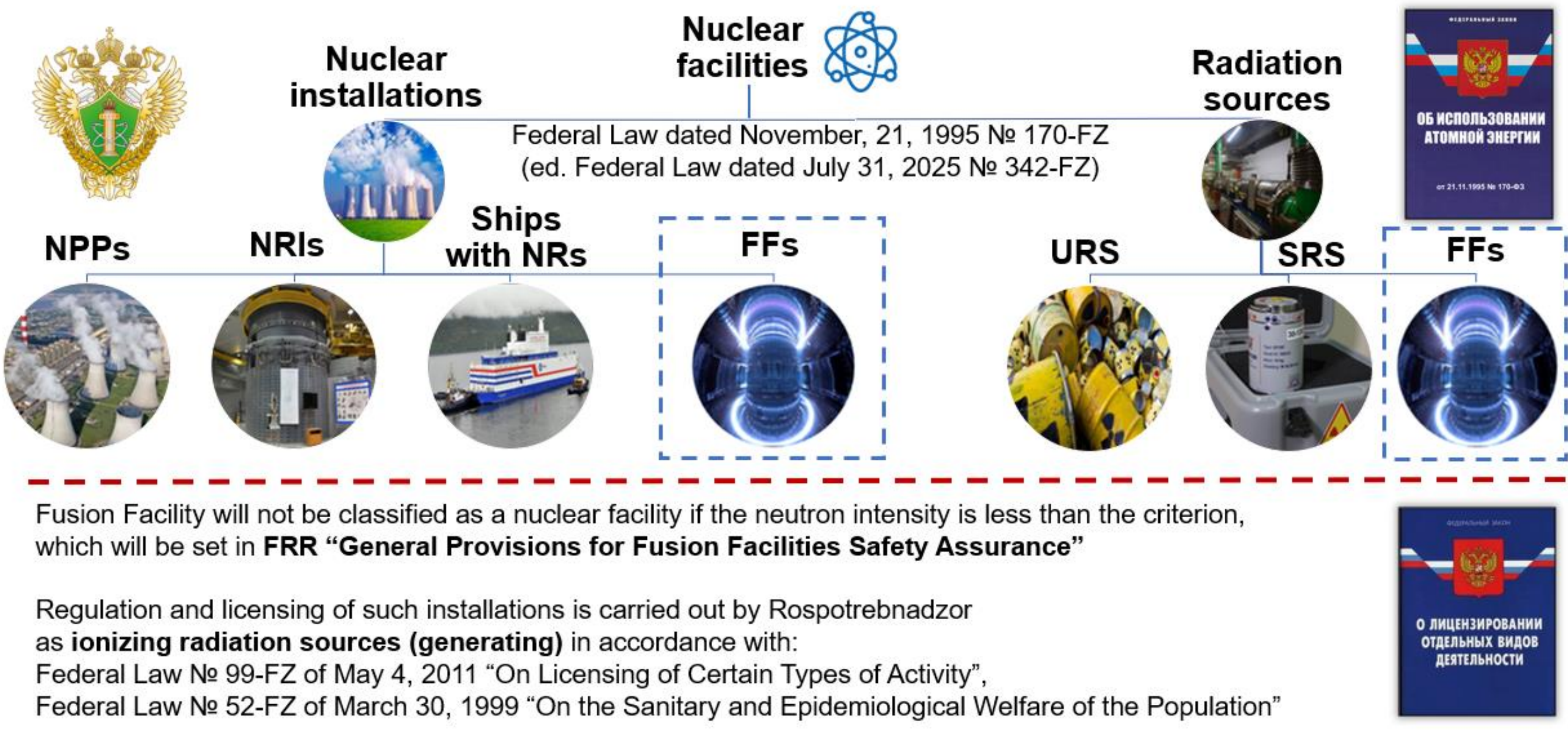
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ABSTRACT

Development of approaches to regulating the safety of Fusion Facilities in the Russian Federation is underway. Recently amendments to legislation were implemented and the development of new rules and regulations in the field of atomic energy use is in active phase.

BACKGROUND

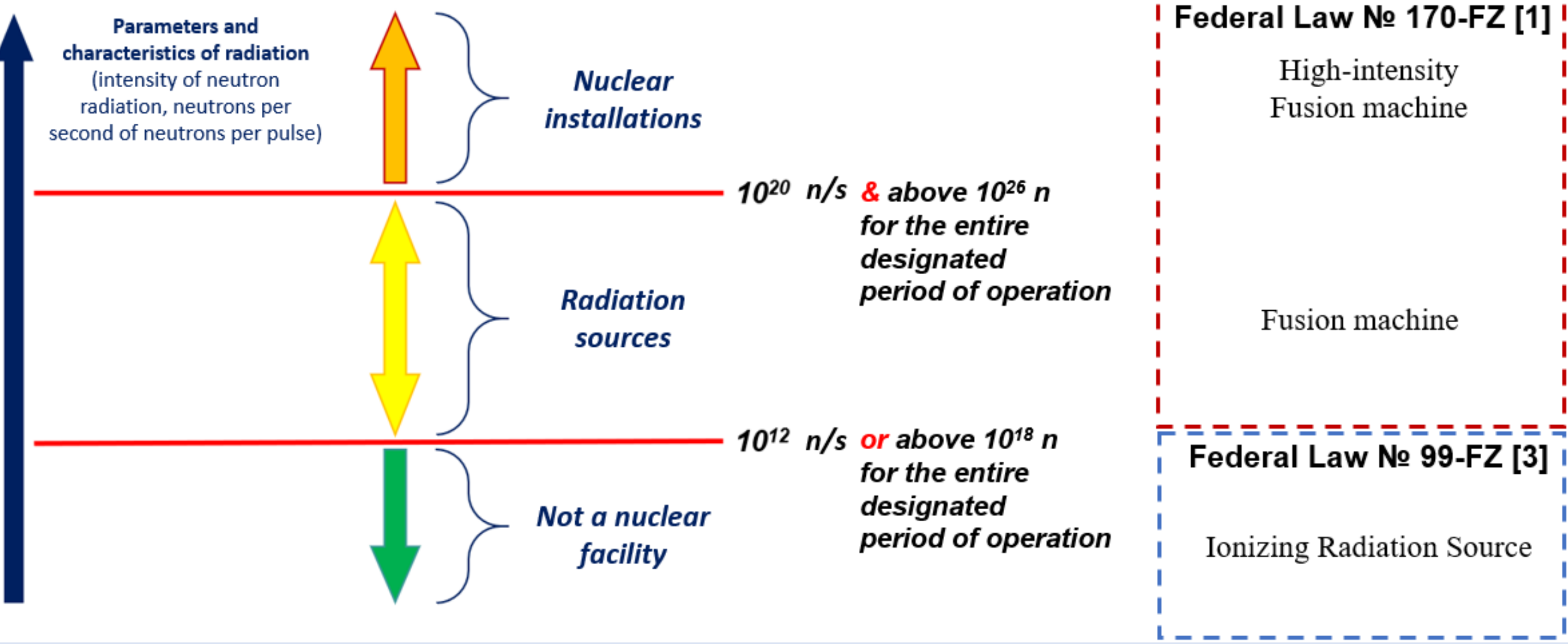
- Analysis of the Russian regulatory framework identified the optimal approach: integrating Fusion Facilities into current nuclear facility classifications under Russian law No. 170-FZ [1].
- In Russian Federation, Fusion Facilities are included in the field of atomic energy use. Federal Law No. 342-FZ [2] (effective January 1, 2027) was developed by Rostechнадзор with the direct participation of the SEC NRS.



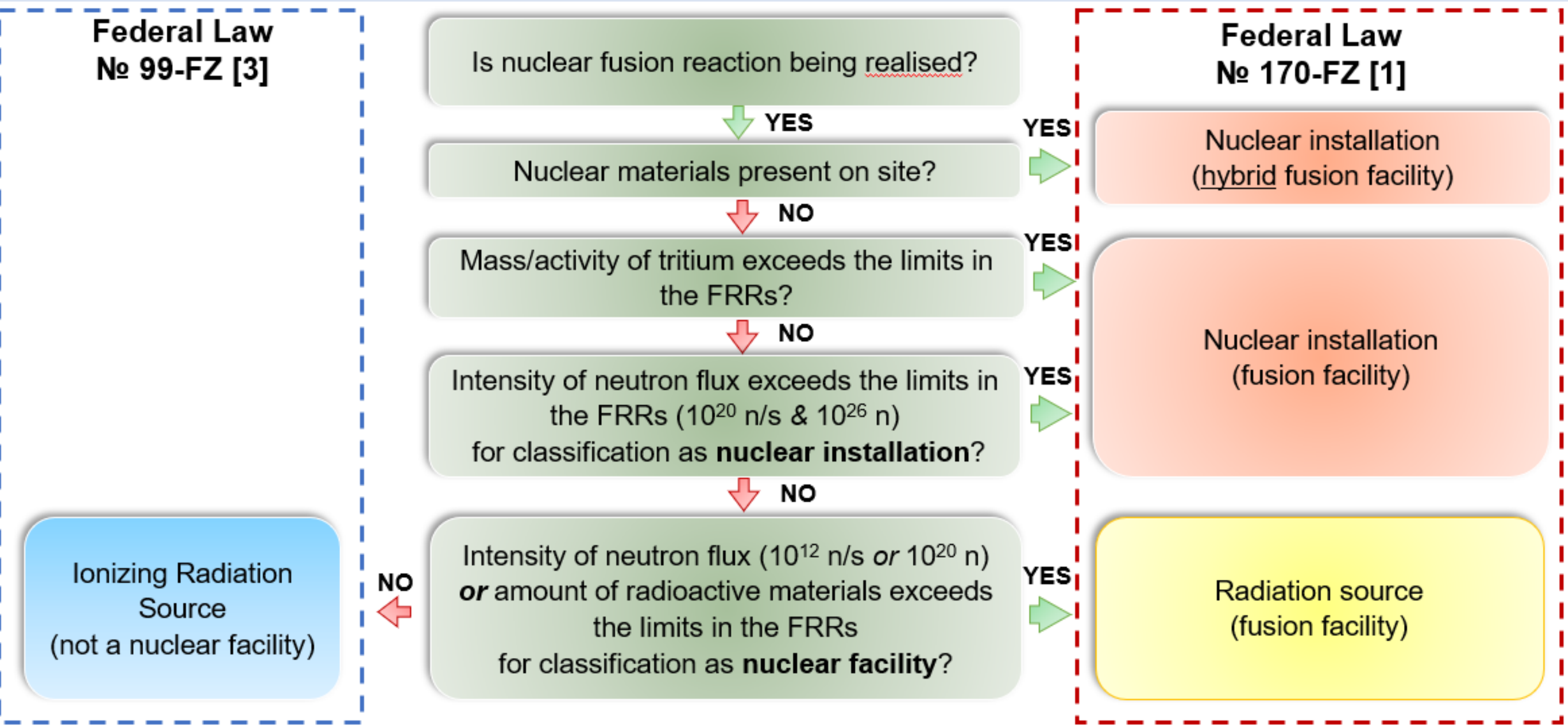
FEDERAL RULES AND REGULATIONS (FRRs) DEVELOPMENT

- Developing new federal rules and regulations (FRRs) to ensure the safety of Fusion Facilities, as well as the protection of personnel, the public, and the environment from potential radiation hazards is of high importance.
- Requirements for the design and safety justification of Fusion Facilities classified as nuclear facilities will become legally binding.
- FRRs shall be applicable to all stages of the life cycle of Fusion Facilities in accordance with the nuclear legislation.

CLASSIFICATION OF FUSION FACILITIES (FFs)



Criteria on Neutron Intensity



Classification scheme of Fusion Facilities

OUTCOME

- The first edition of the FRR "General Safety Provisions for Fusion Facilities" (GSP FF) has been developed. The document is scheduled to be approved not later than November 30, 2026.
- Key terms and definitions for Fusion Facilities safety regulation in GSP FF, drawing from the published Glossary [4].

GRADED APPROACH

GSP FF outlines proposed graded regulatory approach to impose additional safety standards on fusion and hybrid systems with elevated hazard potential.

Additional Requirements for Fusion Facilities classified as a Nuclear Installation

Criteria for classification as a nuclear installation	Additional requirements
Tritium usage	• for tritium-containing systems and components in the rooms where they are located • to control of discharges of radioactive substances • to minimize the accumulation of tritium in materials • to limit the release of radioactive substances, including in case of accidents • for accounting and control of Special Non-Nuclear Materials (including ^3H, ^6Li) in the State System for Accounting and Control
Nuclear materials (NMs) usage (^{238}U , ^{232}Th , etc.)	• for systems and components, including for the containment of NMs within established boundaries • for the means of exclusion of criticality • for heat removal systems (from blankets with NMs) • to control of neutron flux density in the blankets • for accounting and control of NMs • for handling systems and storages of NMs
High-intensity Fusion machine	• to control of the fusion reaction • for protection safety systems • to the probabilistic safety analysis, reliability analysis • for chemistry regimes of the media in the FFs systems and components • to develop of action plans for protection of the personnel and the public in case of accidents • for accident management • to the personnel training

CONCLUSION

Development of Federal rules and regulations in the field of atomic energy use for Fusion Facilities is important step for providing high level of safety. Development of approaches to safety regulation is based on international approaches as well as accumulated experience in regulating safety of NPPs, research reactors and radioactive sources. Close interaction with design and operation organizations of fusion facilities is also one of the key elements of the effective regulatory framework development.

REFERENCES

- [1] Federal Law of the Russian Federation of November 21, 1995 No. 170-FZ "On the Use of Atomic Energy". (<http://www.kremlin.ru/acts/bank/8503>)
- [2] Federal Law of the Russian Federation of July 31, 2025 No. 342-FZ "On Amending Article 3 of the Federal Law 'On the Use of Atomic Energy'" (<http://www.kremlin.ru/acts/bank/52293>)
- [3] Federal Law of the Russian Federation of May 4, 2011 No. 99-FZ "On Licensing of Certain Types of Activity". (<http://www.kremlin.ru/acts/bank/33139>)
- [4] Fusion facilities. Glossary. First edition. (<https://clck.ru/3PbFAw>)