DEVELOPMENT OF A REGULATORY TECHNICAL BASE 
FOR INTEGRITY CONTROL OF THE ELEMENTS OF 
NUCLEAR POWER FACILITIES

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A brief historical account of the development of the domestic-regulatory base securing the integrity of the elements of nuclear power facilities and the contribution made by the Dollezhal Research and Development Institute of Power Engineering to the development of this base are presented. The factors impeding the adoption of updated regulatory requirements in the country, which correspond to the present stage of development of nuclear power and are necessary to develop innovative nuclear power units, are examined. It is noted that there is a need for immediate action to develop codes of regulations for incorporating regulatory-methodological and technical documents and eliminating inconsistencies in government oversight practice and implementation of the federal law on the regulation of technology. The results of a project completed in 2011 on a set of regulations and instructions for ensuring the integrity of the pressure-maintaining elements of sodium-cooled nuclear power reactors are presented. A similar document for VVER is to be completed in 2013.

The history of government regulation and oversight of pressure vessels in Russia dates from 1843, when the requirements for adhering to special regulations for handling steam boilers were formulated in an appendix to the Regulations on Industry. In Great Britain, the first rules for steam boilers were published in 1857. The American Society of Mechanical Engineers (ASME) was formed in 1896, and the first document on regulations for designing steam boilers and pressure vessels was published in 1915. In the USSR and USA, in the middle of the last century Regulations for Boiler Oversight and their American analog were used for the first nuclear reactors. But in 1963 the ASME published a special section of the American Code for elements of nuclear reactors.

In 1971, the Council of Ministers of the USSR tasked the Dollezhal Research and Development Institute of Power Engineering (NIKIET) with the preparation of a complete domestic set of standards for equipment and pipelines in nuclear power plants and research reactors. By 1973, four documents on regulations for arrangement and safe operation, general principles concerning welding and surfacing, rules for testing welds and surfacing and standards for strength calculations were developed, approved and published. In subsequent years, these documents were greatly supplemented on a methodological level and their area of application was extended. The 1989 edition of these documents encompassed reactors not only with pressurized water but also liquid sodium coolant [1–4].


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In 1995, these regulatory-technical documents became federal norms and regulations, which can be attributed to the incidents during the transition from the USSR to the Russian Federation: documents with technical content were raised to a normative-legal level inappropriate for them; they continue to operate at this level today. Any attempts to change their technical content impinge against the legal norms of lawmaking. This is why the technical content of the normative base of nuclear machine engineering has not been updated in the last 20 years, which in some cases becomes an impediment to the adoption of innovative designs for nuclear facilities and makes it necessary to search for ways to advance new technologies within the purview of operative regulatory documents.

The situation of the last two decades has impacted, first and foremost, industry, which was thrown into the market without any changes in technology policy being proposed. A consequence of the ability of manufacturing plants to adapt to the dictated conditions was that products conformed to the technical conditions extant in the USSR but with negative tolerances for wall thickness (in the USSR product prices were determined by weight whereas today they are determined by running meters). Likewise, the adoption of modern means of quality control does not fall within the interests of domestic producers, since they continue to exist according to the technical standards of the 1980s. The result is obvious: the negative tolerance obtaining with the old norms for defects increases the number of equipment and pipelines rejects.

The entry of the Russian Federation into the global community (WTO, Customs Union, etc.) dictates the need for making the normative-technical base for the design, construction, quality control, and operation of nuclear facilities conform to foreign practice. In so doing, the more than 60 years of experience in nuclear machine engineering in Russia, the present-day demands of industry and scientific advances must be taken into account and the interests of domestic producers must be watched.

The practices of nuclear power engineering, government regulation and oversight as well as working training cultivated in Russia over a period of more than 60 years do not permit adopting a foreign regulatory base, as happens in countries which are only just beginning to develop nuclear power. For sample, the ASME code [5] is recognized in more than 50 countries, the South Korean code is an authentic translation of the ASME code into the Korean language, and the Japanese code at the stage where the country was assimilating nuclear technologies was identical to the American code.

A key problem for our country, which has adopted large-scale plans for the development of nuclear power, is to improve the regulatory-technical and methodological base for designing and manufacturing equipment, building and operating objects, reprocessing spent nuclear fuel and salvaging radwaste. The Federal law On Technical Regulation [6] makes it possible to solve this problem in a manner that meets the present-day requirements of the normative-technical base for production processes, quality management and rates of scientific-technical progress.