Study on the 14th Five-Year Plan for Nuclear and Radiation Accident Emergency

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Abstract. During the 13th Five-Year Plan period, China's nuclear and radiation emergency regulations and standards system was gradually strengthened, emergency organizations at all levels were constantly improved. However, there are still some deficiencies in the construction of emergency team, professional technical ability, emergency rescue and so on. This paper comprehensively summarizes the experiences of nuclear and radiation emergency in China during the 13th Five-Year Plan period, and studies the development direction and capacity building in the period of the 14th Five-Year Plan, which provides a reference for the construction of nuclear and radiation emergency in China.

Keywords: Nuclear and radiation, Emergency, The 14th Five-Year, Plan.

1. Introduction
The 13th Five-Year Plan and Vision 2025 for Nuclear Safety and Radioactive Contamination Prevention and Control and the 13th Five-Year National Nuclear Emergency Work Plan released by China indicate that, we should unswervingly strengthen nuclear and radiation emergency work [1]. During the 13th Five-Year period, the level of nuclear and radiation emergency management in China was comprehensively raised in terms of systematization, specialization, standardization and scientificity. At the same time, with the steady development of China's nuclear industry, the continuous innovation of nuclear technology, the design and construction of various new types of nuclear facilities, the tests involving nuclear emergencies, and the increasing attention of the people and the international community to nuclear energy, China's nuclear and radiation emergency work also faces new situations and challenges during the 14th Five-Year Plan period [2].

2. Basic information during the 13th Five-Year Plan period

2.1. Further perfection of the construction of "three systems and one plan"
For nuclear accident emergency, the state has established a three-level management system with the national nuclear accident emergency coordination committee established by the State Council as the coordinating body and the provincial government of China and nuclear installation operators as the organizing and implementing agencies[3]. The Ministry of Ecology and Environment takes the lead in the work of the national nuclear coordination committee and the coordination mechanism for the prevention and mitigation of social risks related to nuclear projects.
2.2. Emergency preparedness work was carried out orderly
With regard to emergency facilities, the capacity-building project of the national nuclear emergency command center has been established and construction of the site has been started, the Ministry of Ecology and Environment has completed the construction of the laboratories of the radiation environmental monitoring front center in Changbai mountain, the Emergency Command Post and the Radiation Environmental Monitoring Front Laboratory in Yanji. All provinces with nuclear power in China have established provincial nuclear emergency command centers, and Guangdong Province has carried out the construction of forward command headquarters. The construction of emergency control center tends to be large-scale and comprehensive.

2.3. The emergency response and support work is carried out smoothly
During the 13th Five-Year period, the state nuclear and radiation emergency response system actively carried out nuclear and radiation emergency support for large-scale state affairs and home-field diplomacy. Emergency rescue and support system further strengthened. The nuclear emergency rescue team has been officially established. Each nuclear power group subordinate each neighboring nuclear power station has signed the mutual support agreement one after another. A group-level nuclear accident emergency support team shall be formed and a nuclear emergency support base shall be selected.

2.4. Effective implementation of the emergency reserve fund system
China has established a nuclear accident emergency reserve system to safeguard the funds required for nuclear accident emergency preparedness and response. The special off-site nuclear emergency income paid by nuclear power plants shall be implemented in accordance with the provisions of financial department "regulations on the administration of special income for nuclear accident emergency preparedness of nuclear power plants".

3. Current problems

3.1. Emergency laws and regulations need to be improved in terms of systematicness and completeness
Based on the feedback from the experience of the prevention and control of the new coronavirus epidemic, the Provisions on nuclear and radiation emergency response in the law on prevention and control of radioactive pollution and the law on nuclear safety are obviously not perfect, important issues such as the evacuation, resettlement of the public and temporary remedial and compensatory measures have not been reflected, and there is a lack of institutional design to safeguard the basic rights of citizens, as well as a certain lack of authorization for local governments to take emergency response measures, the regulations on the location, Accident Investigation and treatment, follow-up treatment and other related issues of the department in charge of nuclear and radiation emergency are inadequate.

3.2. The emergency management mechanism and team building need to be strengthened
With regard to nuclear accident emergency, the state is clearly in charge of the nuclear accident emergency coordination committee. At the local government level, the permanent nuclear emergency coordination committee has been set up in the department of ecological environment, department of science and industry for national defense, department of civil defense, and other departments. For radiation accidents, local ecological environment departments, public security departments and health departments should do a good job according to their respective responsibilities. At present, there are not enough managers and professionals in our local governments. Nuclear and radiation emergency response is a highly specialized work, which should further guarantee the specialization of emergency response team.
3.3. There is a shortage in emergency response capacity in terms of technical expertise

The capacity building of nuclear accident consequence assessment lags behind. At present, China has not established a unified consequence evaluation mechanism of nuclear accident, and there is no specific reference for regulations in consequence evaluation, so there is no unified application mechanism of consequence evaluation.

The degree of autonomous response to the emergency exercise of radiation accident is insufficient. In the emergency exercises for radiation accidents in various provinces, the detailed exercise scripts are still used as the basis, the indicative guiding and control functions are weakened, special training is carried out before the exercises, and the autonomous response of the exercise organization is insufficient, it is unfavorable to test the effectiveness of emergency plan and emergency organization.

Emergency monitoring capacity building needs to be strengthened. The allocation of regional resources for emergency monitoring still needs to be optimized, the development of national-level comprehensive emergency monitoring capacity is relatively slow, and the allocation of regional emergency resources is unbalanced, which can not effectively achieve the full coverage of national territory. State-controlled automatic radiation monitoring network still needs to be improved.

3.4. The emergency reserve system needs to be further improved

At present, only a normative document issued by the Ministry of Finance in 2007 has detailed provisions on the nuclear accident emergency reserve system for nuclear power plants, and there are no relevant provisions on the nuclear accident emergency reserve for research reactors and Nuclear fuel cycle facilities, after the promulgation of the Nuclear Safety Law, it is necessary to put forward the corresponding management measures of emergency reserves according to the actual situation of our country. With regard to the use and management of nuclear accident emergency reserve funds, some off-site nuclear emergency reserve funds in some provinces are not enough to cover their expenditures, such as heavy investment in earlier periods, the need to build new nuclear emergency command centers and build emergency roads.

4. Recommendations for the 14th Five-Year Plan period

4.1. Improve the top-level design, improve the emergency “three systems one plan” system

We will deepen the military-civilian integration strategy and improve the mechanism for sharing emergency resources. In light of the national strategy of military-civilian integration and the actual emergency response, a coordination mechanism featuring the integration of military and civilian capabilities is being improved from the central state organ to all provinces, autonomous regions and municipalities directly under the central government to all units having nuclear installations, so as to increase the efficiency of coordination and support between the military and the locality [4].

We will further rationalize and clarify the working mechanism and interface between the nuclear safety supervision and administration department under the state council, the competent departments of the nuclear industry and Energy, the military, relevant local government, the nuclear power group corporation and the operators of nuclear installations[5]. In order to construct the emergency organization system, we should ensure the stability of the staff, improve the professional skills, and optimize the coordination, command and technical cooperation of the emergency organization.

We will strengthen the institutional safeguards for dealing with nuclear and radiation accidents at the legal level, and study and promote the formulation of a separate law for Nuclear and radiation emergency response. To complete the revision of the regulations on the emergency management of nuclear accidents at nuclear power plants. China will revise the regulations governing nuclear power plant emergency preparedness, and push forward the revision and enactment of regulations governing nuclear emergency preparedness at research reactors and nuclear fuel cycle facilities. We will push forward the revision of the law on the prevention and control of radioactive pollution and related regulations, and standardize the mechanism for emergency management of radiation accidents and related requirements. Revision of national standards for current nuclear emergency plans and
preparedness series. To strive for the 14th Five-Year period each nuclear-related provinces have issued special nuclear and radiation emergency management regulations.

4.2. **Push forward the infrastructure construction and enhance the level of emergency management**

We will accelerate the development of a national nuclear emergency response platform. Enhancement of nuclear emergency preparedness special network connectivity and unified interface will be established to achieve emergency management, radiation environment, meteorology and other information and capacity-sharing among member organizations of the national nuclear emergency coordination committee. To complete the construction of the emergency command center in Yanji. We will gradually move forward with the construction and layout of the regional emergency response center to ensure that the rapid emergency response capacity reaches the northeast region, the beijing-tianjin-hebei region and the sea area around Bohai Sea. Relying on Zhejiang, Sichuan, Guangdong, Gansu and other provincial stations to build regional emergency response centers, driving the overall capacity of the region.

Constructing consequence evaluation system to improve emergency decision-making level. Overall planning of the national nuclear power plant nuclear accident consequences evaluation system, clear the relevant technical standards for system construction, further standardize the national nuclear power plant nuclear accident consequences evaluation system. Deepening the research of basic problems and promoting the research and development of professional equipment. To adapt to the development situation of China's nuclear industry, we will deepen basic research on topics such as emergency planning zones and emergency response levels for new-type nuclear facilities. We will promote the research and development of specialized equipment and systems for emergency radiation monitoring, medical treatment, engineering rescue, maritime rescue and emergency evacuation. We will promote scientific and technological innovation, increase government input, and support the transfer of scientific and technological achievements in the field of nuclear accident management and protection. Giving full play to the scientific research advantages of scientific research institutes and institutions of higher learning, and encouraging the research and development of nuclear emergency rescue equipment and devices.

We will further optimize the regional allocation of national resources for Nuclear and radiation emergency monitoring. We will strengthen our capability to conduct emergency monitoring of marine radioactivity and establish a regional team for marine nuclear and radiological emergency monitoring in a coordinated manner.

4.3. **Improve our emergency response capabilities and strengthen the capacity of emergency rescue and support**

Complete nuclear and radiological emergency drills and drills at various levels and conduct multi-level and multi-dimensional nuclear and radiological emergency drills. An index system combining qualitative assessment with quantitative assessment of emergency response capability has been established, and institutionalization has been promoted to standardize the assessment of nuclear and radiological emergency exercises.

The training and management of nuclear and radiation emergency preparedness shall be strengthened, full-staff training on nuclear and radiation emergency preparedness shall be provided on a regular basis, new models of emergency preparedness training shall be explored, and a practical emergency preparedness training base shall be established.

In accordance with the requirements of constant vigilance, versatile compatibility, interdisciplinary support, and functional coordination, efforts will be made to comprehensively implement the building of a nuclear emergency rescue force and upgrade the national, local and operational levels of emergency rescue capabilities. In accordance with the general requirements and technical requirements for the construction of the rapid rescue team in the nuclear accident emergency site of the nuclear power plant of the nuclear power group, steady progress has been made in the second step of the work deployment. We will explore the establishment of a regional radiation emergency support
system and promote the building of a radiation emergency support team. To establish and improve the information sharing and support mechanism of emergency support teams and emergency materials between provinces and adjacent provinces.

4.4. Deepen regional cooperation and establish an international exchange and rescue mechanism in the field of emergency response

Efforts will be made to strengthen international implementation, promote the transfer of achievements made in this regard, and step up bilateral and multilateral international exchanges and cooperation on nuclear security. Actively carrying out multi-level and all-round export of technologies, equipment, professionals, capabilities and standards for Nuclear and radiological emergency preparedness, so as to promote China's advanced nuclear emergency preparedness technologies and successful experience worldwide, we will support China's strategy in nuclear power, strengthen exchanges with countries exporting nuclear power for nuclear emergency work, and increase our international influence.

4.5. Overall planning support to ensure the effective implementation of contingency planning

We will ensure funding and financial budgetary work, optimize the management model of emergency funds, and increase capital investment. Improving the system of emergency reserves, and in accordance with the relevant requirements of the nuclear safety law and the current situation of the use and management of emergency reserves in China, carrying out the formulation of relevant regulations on the management of emergency reserves, we will further standardize the use of the nuclear accident emergency reserve.

Attaching importance to nuclear and radiation emergency planning, carefully organizing and making overall plans, carrying out relevant research, and formulating special plans for nuclear and radiation emergency response during the 14th Five-Year Plan, or will be related to the government at the same level, the unit's development plan or work plan to be clear, proposed planning objectives, detailed implementation plan. To supervise and inspect the implementation of the plan on a regular basis, organize and conduct mid-term and final assessments, and strengthen the supervision, Inspection and coordination of the implementation of the plan.

5. Conclusion

On the basis of the fruitful results achieved during the 13th Five-Year period, we should further carry out top-level design, improve emergency response mechanisms, promote infrastructure construction, deepen research on basic issues and promote scientific and technological innovation in the field of nuclear and radiological emergency response, enhance the level of emergency management. In terms of international cooperation, it is necessary to strengthen international compliance and bilateral and multilateral international exchanges and cooperation on nuclear security. At the same time, a comprehensive planning guarantee should be made to ensure the effective implementation of the 14th Five-Year Plan.

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