Chapter 2

Nuclear Laws for Peaceful Uses of Nuclear Energy

Deng Ge

Contents

2.1	Establishment and Improvement of the International Nuclear Legal Framework	30
2.1.1	Establishment of an International Nuclear Legal Framework	31
2.1.2	Improvement of the International Nuclear Legal Framework	32
2.1.3	The Key Role of the International Atomic Energy Agency	35
2.1.4	The International Nuclear Legal Framework for the Healthy and Orderly Development of Nuclear Energy	35
2.2	China's Establishment of a Nuclear Legal Framework and Practice of Nuclear Energy Development	36
2.2.1	China's Establishment of a Nuclear Legal Framework	36
2.2.2	China's Nuclear Energy Development	38
2.3	Outlook	39
2.3.1	Promoting the Universal Application of the International Nuclear Legal Framework	39
2.3.2	Assisting Countries in Establishing and Developing National Nuclear Legal Frameworks	40
2.3.3	Continuing to Develop and Improve the International Nuclear Legal Framework	41
	References	42

Abstract The development and utilization of nuclear energy is one of the greatest achievements of the 20th century. It has greatly enhanced the ability of humanity to understand and shape the world and had a significant impact on the development of technology and civilization. In the 21st century, the United Nations (UN) has developed the “Millennium Development Goals” and the “2030 Sustainable Development Goals” to promote a comprehensive solution to the world’s social, economic and environmental issues. To this end, nuclear energy offers unique advantages, but the associated risks and challenges of its further development and utilization must be addressed. Nuclear law is a powerful tool for regulating its development and responding to those risks and challenges. The Chinese Government has always developed nuclear energy for peaceful purposes in a safe and innovative way. At the Nuclear Security Summit in 2014, President Xi Jinping proposed adhering to

D. Ge (✉)
China Atomic Energy Authority, Beijing, China
e-mail: Official.Mail@iaea.org

a rational, coordinated and balanced approach to nuclear security and promoting a fair, cooperative and win–win international nuclear security regime. This not only summarizes China’s experience in establishing a nuclear legal framework and developing nuclear industry, but would also strengthen international nuclear governance and promote nuclear energy to better benefit humanity. The international community should fulfil international obligations strictly, implement national responsibilities effectively, and jointly maintain the UN focused international system and international legal order, contributing to the realization of the common goal of “Atoms for Peace and Development”.

Keywords Nuclear energy · Nuclear technology · Legal framework · Development · Nuclear security · Nuclear governance

2.1 Establishment and Improvement of the International Nuclear Legal Framework

Nuclear energy, also known as atomic energy, refers to the energy released when the structure of the nucleus changes. Unlike other traditional industries, nuclear energy has brought revolutionary changes to human society and industrial development despite only a hundred years of development from theoretical research to industrialization. Nuclear energy is a ‘double-edged sword’. The huge energy produced by nuclear fission not only benefits human life, but also brings risks and challenges. The first risk is nuclear safety. Accidents including at Chernobyl in 1986 and Fukushima Daiichi in 2011 caused serious radioactive contamination, endangered the lives and health of the public and the ecological environment of the countries and their neighbours, and also slowed down the development of the nuclear energy industry worldwide. The second is related to nuclear security. At present, the complexity of international situation, the prominent non-traditional security issues and the potential threat of nuclear terrorism all cannot be ignored. The possibility of nuclear or other radioactive materials falling into the hands of terrorists will pose a major challenge to international security. The third is related to nuclear proliferation. Nuclear technology is of dual use. If peaceful nuclear energy activities cannot be effectively controlled, the diversion of nuclear technologies and materials from peaceful uses to nuclear weapons or other nuclear explosive devices may bring devastating disaster to humanity.

The international nuclear legal framework has come into being with the development of nuclear energy worldwide. It has been continuously improved as the social, economic, scientific and technological issues associated with the development of nuclear energy are addressed, which has promoted the safe, secure and sustainable development of the peaceful uses of nuclear energy.

2.1.1 Establishment of an International Nuclear Legal Framework

In 1928, the International Commission for Radiological Protection (ICRP) was formed and began to study the development of international standards for radiation protection. The commission may be the first international organization devoted to nuclear energy utilization. At that time, there was no urgent need for nuclear law development due to the limited scope and scale of nuclear energy utilization.

In 1945, the first military use of the atomic bomb demonstrated the mass destruction and deterrence of nuclear weapons. In 1954, the connection of Obninsk nuclear power plant to the grid opened the age to use nuclear energy for peaceful purposes. In the 1960s, the nuclear power industry began to develop on a large scale. The oil crisis in 1973 brought new opportunities for the development of the nuclear power industry. In this case, the “Atomic Energy Act” of the United States of America was promulgated in 1946. In December 1953, US President Eisenhower delivered a speech on “Atoms for Peace” to the UN General Assembly.¹ On 29 July 1957, the Statute of the International Atomic Energy Agency (IAEA) came into effect, marking a milestone in the development of the international nuclear legal framework. The Statute stipulates that the mission of the IAEA is to “seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world”, and to “ensure that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”²

At its inception, the IAEA initiated the technical assistance programme to assist developing Member States in capacity building, introducing and developing nuclear technology, and utilizing nuclear technology safely and effectively.³ It also developed safeguard documents “to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose.”⁴ In March 1970, the Treaty on the Non-Proliferation of Nuclear Weapons came into force, stipulating that non-nuclear-weapon States shall not directly or indirectly acquire or manufacture nuclear weapons or other nuclear explosive devices, and requesting non-nuclear-weapon States to negotiate and conclude a comprehensive safeguards agreement with the IAEA.⁵ The Zangger Committee founded in 1971 and the Nuclear Suppliers Group founded in 1974 have established guidelines and a trigger list for nuclear transfers. An international nuclear damage liability regime has been established through the Paris Convention on Third-Party Liability in the Field of Nuclear Energy (Paris Convention) adopted by the

¹Eisenhower 1953.

²IAEA 1989.

³<https://www.iaea.org/services/technical-cooperation-programme/history>. Accessed 2 November 2021.

⁴IAEA 1968.

⁵IAEA 1972; Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature 1 July 1968, entered into force 5 March 1970 (NPT).

European Atomic Energy Community in 1960 and the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention) under the auspices of the IAEA in 1963, to address the risks of personal injury and property loss that may be caused by transboundary nuclear accidents.⁶ An international nuclear legal framework for non-proliferation of nuclear weapons and prevention of the risks of nuclear energy utilization has begun to be shaped.

2.1.2 Improvement of the International Nuclear Legal Framework

The major accidents at the Three Mile Island nuclear power plant in 1979 and the Chernobyl nuclear power plant in 1986 sounded the alarm for the safety of nuclear energy worldwide, and at the same time provided an opportunity for the international community to re-examine and improve the international nuclear legal framework. In the early 1990s, the clandestine nuclear activities of certain parties to the Treaty on the Non-Proliferation of Nuclear Weapons were discovered, prompting the international community to further strengthen the comprehensive safeguards and export control systems. In 2001, the attacks of 11 September aroused serious concerns about nuclear terrorism in the international community. In 2011, the Fukushima Daiichi nuclear accident made nuclear safety issues once again the focus of the international community. The international nuclear legal framework has been further developed and improved in response to new challenges.

2.1.2.1 Nuclear Safety

The Convention on Early Notification of a Nuclear Accident (Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Emergency Assistance Convention), adopted in 1986, state that an international cooperation mechanism shall be established to strengthen information communication and technical assistance to mitigate the consequences of nuclear accidents or radiological emergencies.⁷ The Convention on Nuclear Safety (CNS), adopted in 1994, further strengthens national responsibility for nuclear safety and international cooperation, reflecting an international consensus on what constitutes a high level of safety for protecting people and the environment from the harmful

⁶<https://www.iaea.org/topics/nuclear-liability-conventions>. Accessed 2 November 2021.

⁷Convention on Early Notification of a Nuclear Accident, opened for signature 26 September 1986 (Vienna) and 6 October 1986 (New York), entered into force 27 October 1986 (Early Notification Convention); Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, opened for signature 26 September 1986 (Vienna) and 6 October 1986 (New York), entered into force 26 February 1987 (Emergency Assistance Convention).

effects of ionizing radiation.⁸ The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), adopted in 1997, clarifies the responsibilities and obligations of all countries in the safety of spent fuel and radioactive waste management throughout their lifetime.⁹ The IAEA has developed and issued a series of nuclear safety standards, including Safety Fundamentals, General Safety Requirements, General Safety Guides, Specific Safety Requirements and Specific Safety Guides to assist States in effectively implementing the international obligations under the CNS and the Joint Convention. These standards have constituted a structure of safety principles for the entire process of nuclear energy utilization, and are of great significance for countries to establish effective nuclear safety regulatory systems and technical measures, and to achieve and maintain a high level of nuclear safety worldwide.

2.1.2.2 Nuclear Security

In 1979, the Convention on the Physical Protection of Nuclear Material (CPPNM) was developed under the IAEA's auspices, aiming at strengthening the security of nuclear materials during international transport.¹⁰ The attacks of 11 September accelerated the revision process of the CPPNM. The Amendment to the CPPNM, adopted in July 2005, expands the scope of the Convention to cover physical protection of nuclear facilities and nuclear materials in domestic use, storage and transport, adding provisions to protect nuclear materials and facilities from sabotage.¹¹ The IAEA has also developed the Code of Conduct on the Safety and Security of Radioactive Sources and the Nuclear Security Series to provide guidance for the security efforts of Member States and the international community.¹² In addition, the International Convention on the Suppression of Acts of Nuclear Terrorism, developed under the auspices of the United Nations, was adopted in April 2005 and entered into force in July 2007.¹³

⁸Convention on Nuclear Safety, opened for signature 20 September 1994, entered into force 24 October 1996 (CNS).

⁹Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, opened for signature 29 September 1997, entered into force 18 June 2001 (Joint Convention).

¹⁰Convention on the Physical Protection of Nuclear Material, opened for signature 3 March 1980, entered into force 8 February 1987 (CPPNM).

¹¹2005 Amendment to the Convention on the Physical Protection of Nuclear Material, entered into force 8 May 2016 (Amendment to the CPPNM).

¹²IAEA 2005.

¹³International Convention for the Suppression of Acts of Nuclear Terrorism, opened for signature 14 September 2005, entered into force 7 July 2007 (Nuclear Terrorism Convention or ICSANT).

2.1.2.3 Nuclear Non-proliferation

In 1993, the IAEA launched the “Programme 93+2” aimed at strengthening the effectiveness and improving the efficiency of the safeguards system. The adoption of the Model Additional Protocol in 1997 strengthened the IAEA’s ability to detect undeclared nuclear materials and activities.¹⁴ In 1992, the Nuclear Suppliers Group made the conclusion of a comprehensive safeguards agreement between non-nuclear-weapon States and the IAEA as a condition for nuclear transfer, formulated the guidelines for the transfer of nuclear dual-use equipment, materials, and technology, and further improved nuclear export controls.¹⁵

2.1.2.4 Nuclear Liability

In 1988, under the joint auspices of the IAEA and the Organisation for Economic Co-operation and Development, the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (the Joint Protocol) was adopted; in 1997, the Convention on Supplementary Compensation for Nuclear Damage was adopted, promoting the establishment of a global nuclear damage liability system.¹⁶

2.1.2.5 Nuclear Cooperation

With the support of the IAEA, four regional cooperation agreements for the promotion of nuclear science and technology were signed in Asia, Africa and Latin America. As of the end of 2020, the IAEA has signed Revised Supplementary Agreements Concerning the Provision of Technical Assistance with 146 countries and regions. There are 1139 technical cooperation projects being implemented and 124 coordinated research projects involving health and nutrition, food and agriculture, water and environment, industrial application/radiation technology, safety and security, energy planning and nuclear power, and nuclear knowledge development and management, providing strong support for Member States in capacity building and human resource training in nuclear applications.¹⁷

¹⁴IAEA 1997.

¹⁵IAEA 2019.

¹⁶<https://www.iaea.org/topics/nuclear-liability-conventions>. Accessed 2 November 2021.

¹⁷IAEA 2020.

2.1.3 The Key Role of the International Atomic Energy Agency

As the most important intergovernmental organization specialized in the nuclear field, the IAEA plays a central role in promoting the establishment and improvement of the international nuclear legal framework. The IAEA also promotes the effective implementation and universal application of international nuclear laws by providing legislative assistance, peer review, expert advice, and personnel training, and assists Member States in establishing national nuclear legal frameworks. As of the end of 2020, the IAEA had issued a total of 129 nuclear safety standards and 39 nuclear security guidelines to assist Member States in developing and utilizing nuclear energy and technology in a safe and secure manner. The IAEA has also signed safeguards agreements with 184 countries, additional protocols with 136 countries, and small quantities protocols with 94 countries to verify nuclear materials, facilities and activities of the States involved.¹⁸

2.1.4 The International Nuclear Legal Framework for the Healthy and Orderly Development of Nuclear Energy

Since the establishment of the IAEA in 1957, dozens of multilateral international conventions related to the uses of nuclear energy, as well as a large number of bilateral or multilateral agreements on the uses of nuclear energy between countries and with international organizations, have been formed, constituting a relatively complete international nuclear legal framework, based on the principles of peace, safety, security, liability and cooperation, and providing a legal basis for the development of the peaceful uses of nuclear energy worldwide.

As of the end of 2020, there were 442 nuclear power units in operation worldwide, with a total installed capacity of more than 393 gigawatts (GW); 52 nuclear power units under construction, with a total installed capacity of more than 54.4 GW.¹⁹ Nuclear power contributes more than a quarter of low-carbon power supply. Over the past 50 years, about 70 gigatonnes (Gt) of CO₂ emissions have been avoided thanks to the uses of nuclear power worldwide. At present, CO₂ emissions can be reduced by over 1.2 Gt annually.²⁰ Given all countries' policies and measures for responding to global climate change and technological innovations that have improved the safety and economy of nuclear power, nuclear energy's contribution and role in carbon emission reduction will be further expanded. According to the Energy, Electricity and Nuclear Power Estimates for the Period up to 2050 released by the IAEA in

¹⁸Ibid.

¹⁹IAEA 2021.

²⁰IEA 2019.

September 2021, in the high case, by 2050, the installed nuclear power capacity worldwide will more than double the current capacity, reaching 792 GW; the share of nuclear power in the total power generation will rise to 12.3%. Many developing countries in Asia, Africa, South America and Eastern Europe will have the greatest demand for nuclear power and the fastest development in the future.²¹

2.2 China's Establishment of a Nuclear Legal Framework and Practice of Nuclear Energy Development

2.2.1 China's Establishment of a Nuclear Legal Framework

China's nuclear industry was founded in 1955. As early as the 1960s, the Chinese Government issued the "Interim Regulations on Hygiene Protection for Radiological Work", which stipulated the radiological protection issues that may arise in the development of the nuclear industry.

In the early 1980s, the Chinese Government made a major strategic deployment of reform and opening up, and decided to vigorously develop nuclear power to serve the economic development. In March 1985, the construction of the Qinshan Nuclear Power Plant was started. It was the first nuclear power plant which was independently designed, built and operated by China. In December 1991, it was successfully connected to the grid for power generation, realizing the "zero" breakthrough of nuclear power in mainland China. In order to meet the needs of nuclear power development, the Chinese Government promulgated the "Regulations on the Safety Supervision and Administration of Civil Nuclear Facilities" and the "Approval of the State Council on Compensation for Damages in Nuclear Accidents" in 1986, the "Regulations on Management and Control of Nuclear Materials" in 1987, the "Environmental Policy on the Disposal of China's Medium and Low Level Radioactive Waste" in 1992, the "Regulations on Emergency Management of Nuclear Power Plants and Nuclear Accidents" in 1993, and the "Regulations on Safety and Security of Nuclear Power Plants" in 1997. The above mentioned regulations cover nuclear safety, nuclear security, nuclear material control, nuclear liability, nuclear emergency response, radioactive waste management and other aspects, forming a legal system that regulates and promotes the development of nuclear energy.²²

Since the beginning of the new century, China's nuclear power development strategy has gone through the stages of "moderate development", "active development", "safe and efficient development", and "proactive and well-ordered development while prioritizing safety and security". To ensure the safe, efficient and sustainable development of nuclear energy, China has further strengthened the construction of a nuclear legal framework. Since 2003, China has successively promulgated the

²¹IAEA 2021.

²²State Council of the People's Republic of China 1986, 1987, 1993.

“Law on the Prevention and Control of Radioactive Pollution”, the “Regulations on the Safety and Protection of Radioisotopes and Radiation Devices”, the “Regulations on the Supervision and Administration of Civil Nuclear Safety Equipment”, the “Regulations on the Supervision and Administration of the Transport of Radioactive Materials”, and the “Regulations on the Safety Management of Radioactive Waste”; revised the “Regulations on Emergency Management of Nuclear Accidents in Nuclear Power Plants” and the “The State Council’s Reply on Compensation for Damages in Nuclear Accidents”; promulgated, implemented and regularly updated the “National Nuclear Emergency Plan”.²³ In 2018, the “Law of Nuclear Safety” was formally implemented. At present, the “Law of Atomic Energy” is about to be submitted to the Standing Committee of the National People’s Congress for deliberation. A number of regulations and standard guidelines for nuclear safety, nuclear security, and nuclear import and export management have been promulgated one after another, and a nuclear legal framework including laws, administrative regulations and departmental rules has been established. As of June 2019, in the nuclear field, China had promulgated nine administrative regulations, nearly 40 departmental regulations, more than 100 safety guidelines, formulated more than 1000 relevant national and industrial standards, and 31 provinces, autonomous regions, and municipalities had formulated more than 200 local regulations, which played an important role in the safe and efficient development of China’s nuclear industry.

China actively participates in international and regional cooperation in the peaceful use of nuclear energy and the non-proliferation process. In 1984, China joined the IAEA; in 1992, China joined the Treaty on the Non-Proliferation of Nuclear Weapons, and subsequently joined the Zangger Committee and Nuclear Suppliers Group and other export control framework. China has successively acceded to the Early Notification Convention, Emergency Assistance Convention, Nuclear Safety Convention, Joint Convention and other international nuclear safety conventions, as well as the International Convention for the Suppression of Acts of Nuclear Terrorism, Convention on the Physical Protection of Nuclear Material and its amendments and other international conventions on nuclear security. China strictly fulfilled its international obligations and commitments, and accordingly improved its domestic nuclear legal framework. In 1997, the Chinese Government issued the “Notice of the State Council on Issues Concerning the Strict Implementation of China’s Nuclear Export Policy”, clearly stipulating that nuclear exports should be safeguarded by the IAEA, and subsequently issued the “Regulations on Nuclear Export Control”, “Nuclear Dual-Use Products and Related Technologies” and other administrative regulations; in 2004, relevant regulations were revised in accordance with the commitments made by joining the Nuclear Suppliers Group, and China’s nuclear and dual-use nuclear export control measures were in line with international practices.²⁴

²³The Central People’s Government of China 2003; State Council of the People’s Republic of China 2005, 2007, 2009, 2011.

²⁴State Council of the People’s Republic of China 1998, 1997.

2.2.2 *China's Nuclear Energy Development*

With the effective nuclear legal framework, China's nuclear energy development has made great progress. So far, China has never experienced a nuclear incident of level 2 or above, and it followed the principle of 'keeping nuclear material under lock and key', which has created good conditions for the development of nuclear energy. At present, China has become the fastest growing country in the world for nuclear power. As of the end of September 2021, China has 51 nuclear power units in operation with an installed capacity of 53.3 GW; 18 nuclear power units under construction with an installed capacity of 19 GW.²⁵ In 2020, China's nuclear power generation capacity was 366.243 billion kW-h, with an increase of 5.02% year-on-year, accounting for approximately 4.94% of the country's cumulative power generation. Compared with coal-fired power generation, the annual nuclear power generation is equivalent to reducing the burning of 104.7 megatons (Mt) of standard coal, reducing the emission of 274.4 Mt of CO₂, 0.89 Mt of sulphur dioxide, and 0.78 Mt of nitrogen oxides, which is equivalent to afforestation of 771,400 ha.²⁶ The Chinese Government proposes that in 2021–2025, it will vigorously develop new energy, develop nuclear energy in a proactive and well-ordered manner while prioritizing safety and security, and continue to promote the clean and efficient use of coal, so as to reduce energy consumption per unit of GDP and carbon dioxide emissions by 13.5 and 18%.²⁷ In the context of carbon peaks and carbon neutrality, the transformation of China's energy and power system to a cleaner and low-carbon one will be further accelerated. As a type of clean energy with net zero emissions, nuclear energy will have a broader space for development. It is estimated that by 2025, China's nuclear power installed capacity in operation will reach more than 70 GW, and the installed capacity under construction will be about 50 GW; by 2030, China's nuclear power installed capacity in operation will exceed 100 GW, and the installed capacity under construction will exceed 50 GW; nuclear power generation will account for 8% of the country's total power generation.²⁸ Nuclear energy will play an indispensable role in supporting China's strategy and achieving the goal of carbon peak and carbon neutrality.

Over the past few decades, China's non-power application of the nuclear technology industry has continued to grow, forming a relatively complete industrial system in terms of material modification, non-destructive testing, irradiation breeding, irradiation processing of food and agricultural products, and nuclear medicine. Especially in recent years, the annual output value scale has achieved an increase of more than 20%, which has become a new bright spot to promote the development of the national economy. Since the outbreak of COVID-19, China has

²⁵Sourced from the latest statistics of the China Atomic Energy Authority.

²⁶Tingke et al. 2021.

²⁷Refer to the government work report delivered by Premier Li Keqiang of the State Council of China at the Fourth Session of the Thirteenth National People's Congress on 5 March 2021, http://www.gov.cn/premier/2021-03/12/content_5592671.htm. Accessed 2 November 2021.

²⁸Data taken from Tingke et al. 2021.

fully exploited its unique advantages in nuclear technology, using irradiation sterilization instead of traditional chemical sterilization, shortening the sterilization time of medical protective clothing from 7 to 10 days to one day, greatly relieving the urgent need for 100,000 sets of protective clothing daily in Wuhan and other regions. As of the end of 2020, there were 80,414 companies engaged in the production, sales and use of radioisotopes and radiation devices in China, with an increase of 22.7% over 2015; there were 149,452 radioactive sources and 205,280 radiation devices of various types in use, with an increase of 22.1 and 49.5% over 2015.²⁹ China will further expand its non-power application of the nuclear technology industry and cooperate with other countries in accordance with the principles of complementary advantages and mutual benefit.

2.3 Outlook

As a type of clean, low-carbon, and highly efficient base-load energy, nuclear energy is an important option for achieving the UN's 2030 Sustainable Development Goals and responding to the challenges of global climate change. The IAEA, the International Energy Agency and other organizations have issued forecasts for many years, believing that the share of nuclear energy in the total global energy will maintain a long term growth momentum in the future.³⁰ The international community should uphold the concept of a community with a shared future for nuclear safety, actively promote the universal application and continuous improvement of the international nuclear legal framework, and make unremitting efforts for the long term and healthy development of the global peaceful use of nuclear energy.

2.3.1 *Promoting the Universal Application of the International Nuclear Legal Framework*

The people of all countries live in a global village, forming a community of shared destiny. Each country should not only enjoy the right to the peaceful use of nuclear energy, but also shoulder the responsibility and obligation of preventing nuclear proliferation, maintaining nuclear safety and nuclear security. At the 2014 Nuclear Security Summit in The Hague, Chinese President Xi Jinping pointed out that “nothing can be accomplished without norms or standards”.³¹ All countries should earnestly fulfil their obligations under the international legal framework on nuclear safety, fully implement relevant UN Security Council resolutions, consolidate and

²⁹NNSA 2020.

³⁰IEA 2019.

³¹Full text can be found at http://en.qsttheory.cn/2021-01/11/c_607626.htm.

develop the existing nuclear safety legal framework, and provide institutional guarantees and universally followed guidelines for the governance of the international nuclear industry.

However, the current cornerstones of international nuclear law such as the Treaty on the Non-Proliferation of Nuclear Weapons, the Convention on the Physical Protection of Nuclear Material and its Amendments, the Comprehensive Safeguards Agreement of the IAEA and its additional protocols have not yet achieved universal application, limiting the effectiveness of the international nuclear legal framework. The international community should actively promote the universal application of the international nuclear legal framework, ensure that all countries that carry out peaceful use of nuclear energy activities follow the basic principles and requirements determined by the international nuclear legal framework, strengthen the construction of non-proliferation, nuclear safety, and nuclear security systems. While benefiting human beings with nuclear energy, we should also protect our common home on the earth.

2.3.2 Assisting Countries in Establishing and Developing National Nuclear Legal Frameworks

The IAEA has presided over the formulation of a series of international conventions in the nuclear field, as well as nuclear safety and security guidelines. All relevant countries need to translate the requirements of international conventions into national legislation to ensure that international obligations and related requirements are actually implemented. At the very beginning of the development of nuclear energy, emerging nuclear energy countries need to establish a nuclear legal framework that regulates and promotes the safe development of nuclear energy.

The IAEA has extensive experience in building a nuclear legal framework, and has carried out a lot of work in assisting Member States to establish a national nuclear legal framework. For example, the IAEA compiled the Handbook on Nuclear Law and its second volume Nuclear Law Handbook: Implementing Legislation and implemented a legislative assistance programme.³² With the development of the global peaceful use of nuclear energy, the IAEA should further increase its nuclear legislative assistance to Member States in need, raise Member States' awareness of international legal instruments in the nuclear field, support Member States in fulfilling their international obligations and commitments, and provide assistance to Member States in developing national nuclear legislation.

³²IAEA 2003; IAEA 2010.

2.3.3 Continuing to Develop and Improve the International Nuclear Legal Framework

The international nuclear legal framework is being promoted by nuclear energy, and it will surely continue to improve with the development of global nuclear energy. At present, the R&D of fourth-generation nuclear energy systems is increasing, small modular reactor (SMR) technologies are emerging one after another, and the development of nuclear fusion technology is steadily advancing, putting forward many new requirements for the development and improvement of the international nuclear legal framework. In addition, the safeguards verification of military nuclear power installations in non-nuclear-weapon States poses new challenges to the international nuclear legal framework.

Advanced SMRs adopt standardized and modular designs, with less initial investment scale and less site selection requirements, so they can be flexibly deployed. Some SMRs may be deployed in urban areas with high electricity load and high population density, and some may be deployed on the sea far away from the mainland. Dealing with safety and security issues in special application scenarios for SMRs and clarifying relevant technical and regulatory requirements are major issues that the international community must resolve as soon as possible.

Nuclear fusion energy is one of the ultimate ways to solve human energy and environmental problems. Nuclear fusion energy does not deviate from the overall scope of nuclear energy, and radiological risks cannot be eliminated 100%. The design, construction, operation and decommissioning of related facilities should be included in the scope of nuclear safety supervision and regulated by the corresponding legal and regulatory framework. Moreover, in the process of peaceful use of nuclear fusion energy, the possibility that related materials and technologies will be transferred to the manufacture of thermonuclear weapons cannot be ruled out. Therefore, the international community urgently needs to strengthen research to clarify the requirements of safety, security and peaceful use in the development and utilization of nuclear fusion energy as soon as possible, so as to lay a legal foundation for the large-scale application of nuclear fusion energy.

The peaceful use of nuclear energy is the common aspiration of all countries in the world, and it is our common responsibility to ensure the safety, security and sustainable development of nuclear energy. The international community should focus on promoting nuclear energy for the benefit of human beings, and promote the continuous improvement of the international nuclear legal framework in accordance with the principles of peace, safety, security, liability and cooperation, striving unremittingly for strengthening global nuclear governance, realizing “atoms for peace and development”, and building a community with a shared future for human beings.

References

- Eisenhower D D (1953) Speech to the United Nations General Assembly, 8 December 1953, New York
- International Atomic Energy Agency (IAEA) (1968) The Agency's Safeguards System, INFCIRC/66/Rev.2
- International Atomic Energy Agency (IAEA) (1972) The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, INFCIRC/153 (Corrected)
- International Atomic Energy Agency (IAEA) (1989) Statute. IAEA, Vienna
- International Atomic Energy Agency (IAEA) (1997) Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards, INFCIRC/540
- International Atomic Energy Agency (IAEA) (2003) Handbook on Nuclear Law. IAEA, Vienna
- International Atomic Energy Agency (IAEA) (2005) Code of Conduct on the Safety and Security of Radioactive Sources: Guidance on the Import and Export of Radioactive Sources. IAEA, Vienna
- International Atomic Energy Agency (IAEA) (2010) Handbook on Nuclear Law: Implementing Legislation. IAEA, Vienna
- International Atomic Energy Agency (IAEA) (2019) Communication Received from the Permanent Mission of the Republic of Kazakhstan to the International Atomic Energy Agency on Behalf of the Participating Governments of the Nuclear Suppliers Group, INFCIRC/539/Rev.7
- International Atomic Energy Agency (IAEA) (2020) IAEA Annual Report 2020. <https://www.iaea.org/sites/default/files/gc/gc65-5.pdf>. Accessed 2 November 2021
- International Atomic Energy Agency (IAEA) (2021) Energy, Electricity and Nuclear Power Estimates for the Period up to 2050, Reference Data Series. IAEA, Vienna
- International Energy Agency (IEA) (2019) Nuclear Power in a Clean Energy System. <https://www.iea.org/reports/nuclear-power-in-a-clean-energy-system>. Accessed 2 November 2021
- National Nuclear Safety Administration (NNSA) of the People's Republic of China (2020) 2020 Annual Report. <https://nnsa.mee.gov.cn/ztzl/haqnb/202106/P020210629665594621226.pdf>. Accessed 2 November 2021
- State Council of the People's Republic of China (1986) Regulations on the Safety Supervision and Administration of Civil Nuclear Facilities. http://www.nea.gov.cn/2017-11/03/c_136725275.htm. Accessed 2 November 2021
- State Council of the People's Republic of China (1987) Regulations on the Management and Control of Nuclear Materials. http://www.nea.gov.cn/2017-11/03/c_136725276.htm. Accessed 2 November 2021
- State Council of the People's Republic of China (1993) Regulations on the Emergency Management of Nuclear Power Plant Accidents. <http://extwprlegs1.fao.org/docs/pdf/chn150237.pdf>. Accessed 2 November 2021
- State Council of the People's Republic of China (1997) Regulations on Nuclear Export Control. <https://www.fmprc.gov.cn/ce/cgvienna/eng/dbtyw/fks/t127622.htm>. Accessed 2 November 2021
- State Council of the People's Republic of China (1998) Regulations on Export Control of Nuclear Dual-Use Products and Related Technologies. <https://www.fmprc.gov.cn/ce/cgvienna/eng/dbtyw/fks/t127623.htm>. Accessed 2 November 2021
- State Council of the People's Republic of China (2005) Regulations on the Safety and Protection of Radioisotopes and Radiation Devices. <http://extwprlegs1.fao.org/docs/pdf/chn152926.pdf>. Accessed 2 November 2021
- State Council of the People's Republic of China (2007) Regulations on the Supervision and Administration of Civil Nuclear Safety Equipment. <http://extwprlegs1.fao.org/docs/pdf/chn149833.pdf>. Accessed 2 November 2021
- State Council of the People's Republic of China (2009) Regulations on Supervision and Administration of the Transport of Radioactive Materials. <http://extwprlegs1.fao.org/docs/pdf/chn153827.pdf>. Accessed 2 November 2021

State Council of the People's Republic of China (2011) Regulations on the Safety Management of Radioactive Waste. http://www.gov.cn/zwggk/2011-12/29/content_2033177.htm. Accessed 2 November 2021

The Central People's Government of China (2003) Law on the Prevention and Control of Radioactive Pollution (PRC Presidential Order No. 6 of 2003) https://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=76093. Accessed 2 November 2021

Tingke Z, Minrong L, Qilong P (2021) China Nuclear Energy Development Report. Social Sciences Literature Press, Beijing

The opinions expressed in this chapter are those of the author(s) and do not necessarily reflect the views of the IAEA: International Atomic Energy Agency, its Board of Directors, or the countries they represent.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 3.0 IGO license (<http://creativecommons.org/licenses/by/3.0/igo/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the IAEA: International Atomic Energy Agency, provide a link to the Creative Commons license and indicate if changes were made.

Any dispute related to the use of the works of the IAEA: International Atomic Energy Agency that cannot be settled amicably shall be submitted to arbitration pursuant to the UNCITRAL rules. The use of the IAEA: International Atomic Energy Agency's name for any purpose other than for attribution, and the use of the IAEA: International Atomic Energy Agency's logo, shall be subject to a separate written license agreement between the IAEA: International Atomic Energy Agency and the user and is not authorized as part of this CC-IGO license. Note that the link provided above includes additional terms and conditions of the license.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.