

# International Nuclear Law: A Case Study of Pakistan

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## Abstract

*Pakistan is planning to expand its nuclear energy programme for peaceful purposes, however, such expansions require stringent laws and regulations. Therefore, it is important to understand nuclear law and what does it require from the states, which are using nuclear technology, for various peaceful applications including nuclear energy. Thus, this paper aims to provide an overview of nuclear law related to peaceful usages of nuclear technology. The paper also tries to examine the implementation of nuclear law in Pakistan. It also discusses some of the challenges related to nuclear law at the international level, which include difficulties of nuclear law in remaining at pace with technological developments; reactive regime; emerging nuclear security threats; duplications of nuclear security efforts; intrusive nature of safeguards and ignoring strategic ground realities. The challenges, at the national level, include limited nuclear law expertise, insignificant propagation of Pakistan's adherence and implementation accomplishments. For overcoming challenges, at the national level, this paper recommends development of academic and institutional capability with regards to nuclear law and sufficient dissemination of Pakistan's achievements in adherence to and implementation of nuclear law.*

**Keywords:** Nuclear Law, Nuclear Safety Regime, Nuclear Security Regime, Pakistan, Nuclear Law Challenges.

## Introduction

For any country, energy is a vehicle of socio-economic development. Given that Pakistan's economy has been adversely affected by an acute energy shortage, fluctuating seasonally between 7000-9000 MWe, the energy deficit needs to be tackled on an emergency basis. Considering growing urbanisation and industrialisation in Pakistan, demands for

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electricity are increasing day by day. Pakistan's current installed generation capacity is approximately 25,000 MWe, in which the share of nuclear energy to the national grid is only about 4.90 per cent.<sup>1</sup>

In view of deficient fossil fuel reserves and the growing dangers of climate change, renewable energy and nuclear power appears to be more viable options in the overall energy mix. In this backdrop, Pakistan has expressed its interest to increase its nuclear power capacity up to 8,800 MWe by 2030.<sup>2</sup> However, such expansion in nuclear power programmes merits a thorough evaluation of Pakistan's adherence to international nuclear law. Without a stringent legal and regulatory regime, no business can be executed effectively. Like other businesses, nuclear energy requires strong backing of nuclear law so as to run its business according to national laws and international norms. Here arise few questions: is there a separate law for governing nuclear energy? What is nuclear law: is it a new subset of international law or has deep roots in history? Also important is to know that what are the key components of nuclear law and how these components are being implemented by Pakistan, which is already using nuclear technology from last five decades; lastly, whether there are any impediments related to nuclear law at the international and national level.

With this backdrop, the present study attempts to explore international nuclear law with a detailed explanation of its four important components. It aims to provide an objective examination of the implementation of nuclear law in Pakistan. It also examine the challenges associated with nuclear law at the international and national level. In the end, it will try to present some suggestions to Pakistan for developing nuclear law expertise and projecting its implementation and adherence to nuclear law.

The paper is organised in three parts. Part one analyses and reviews the principles and scope of international nuclear law. Part two examines the status of international nuclear law in Pakistan, focusing in more detail on its adherence and implementation. Part three addresses the challenges at national and international level and provides the way forward to overcome these challenges.

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<sup>1</sup> National Electric Power Regulatory Authority, *State of Industry Report 2015* (Islamabad: NEPRA, 2015), 88.

<sup>2</sup> "Pakistan Plans to Build Several New Nuclear Reactors: Official," *Express Tribune*, November 1, 2017.

## Nuclear Law

The law related to peaceful uses of nuclear science and technology is known as nuclear law. Since nuclear technology has associated risks to the health and safety of individuals as well as the environment, these risks need to be managed without compromising the benefits of nuclear energy. It has a wider peaceful application in a variety of fields such as medicine, agriculture, industry and power generation. Therefore, a fine balance is needed between benefits and the risks of nuclear technology. Such balancing requires nuclear law to regulate benefits. Consequently, nuclear law serves two functions: i.) promotion and protection and ii.) promoting nuclear science and technology while protecting its users from its harmful effects.

The comprehensive literature available on nuclear law is drafted by the International Atomic Energy Agency (IAEA), which produced a dedicated nuclear law series. The IAEA's "Handbook on Nuclear Law" provides an overall character of nuclear law and the process by which it is developed and applied. It assists a state by giving guidance for governments in enhancing their laws and regulations, in harmonising them with internationally recognised standards and in meeting their obligations under relevant international instruments. The book defines nuclear law as the "body of special legal norms created to regulate the conduct of legal or natural persons who are engaged in activities related to fissionable materials, ionising radiations and those who are exposed to natural sources of radiations."<sup>3</sup>

Simply stated, four important elements related to nuclear law are provided in this definition. Firstly, considering nuclear as special technology (dual-use), this requires special law; second, balancing between benefits and risks, requires regulations for allowing former and curbing latter; thirdly, this law is meant for 'legal persons.' Apart from individuals, it also involves certain entities from commercial, academic, scientific and governmental sectors; fourthly, it focuses on the entire range of activities that involves radioactivity. Thus, the purpose of nuclear law is to protect the individuals, property and environment from ionising radiation by providing a legal framework for conducting nuclear related activities.<sup>4</sup>

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<sup>3</sup> Carlton Stoiber, Alec Baer, Norbert Pelzer and Wolfram Tonhause, *Handbook on Nuclear Law* (Vienna: International Atomic Energy Agency, 2003), 4.

<sup>4</sup> *Ibid.*, 5.

## Scope of International Nuclear Law

International nuclear law has a wide spectrum and covers a range of topics, including nuclear safety (radiation protection, emergency preparedness and response, waste management/decommissioning and environmental protection); nuclear security (physical protection, illicit trafficking, border control and detection); safeguards and non-proliferation; international trade and nuclear cooperation; third-party liability, compensation and insurance. Therefore, nuclear law can be categorised into four main regimes: nuclear safety regime; nuclear security regime; nuclear liability regime and non-proliferation/safeguards regime. Each of these regimes, supplemented by legally binding instruments, non-binding commitments, rigorous technical standards and intrusive administrative arrangements would be described in the succeeding paragraphs.

### *Nuclear Safety Regime*

Nuclear safety regime is comprised of institutional, legal and technical mechanisms to ensure safe operation of nuclear installations all over the world.<sup>5</sup> It includes legal instruments, international nuclear safety standards, advisory and review services of the IAEA and the national legal and regulatory framework.<sup>6</sup> Nuclear safety includes radiation safety, waste safety, transport safety, emergency preparedness, etc. Legal mechanisms for nuclear safety include four instruments: the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (CACNARE<sup>7</sup>), the

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<sup>5</sup> International Nuclear Safety Group, *Strengthening the Global Nuclear Safety Regime, INSAG-21* (Vienna: IAEA, 2006), 5.

<sup>6</sup> Aaron Shull, "The Global Nuclear Safety and Security Regimes," Nuclear Energy Futures Papers, no. 2 (Ontario: Centre for International Governance Innovation, November 2008),

[https://www.cigionline.org/sites/default/files/nuclear\\_safety\\_and\\_security.pdf](https://www.cigionline.org/sites/default/files/nuclear_safety_and_security.pdf)

<sup>7</sup> The CACNARE was adopted in 1986, to facilitate prompt assistance in the event of nuclear accidents or radiological emergencies. It requires state parties to notify the IAEA of their available experts, equipment, etc., for possible assistance. On receiving request, each state party can decide whether it can render the requested assistance as well as its scope and terms. Both Conventions require to identify points of contact, available round-the-clock, as well as, competent authorities authorised to issue or receive notifications and requests for assistance and to arrange for requested assistance.

Convention on Early Notification of a Nuclear Accident (CENNA),<sup>8</sup> Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management<sup>9</sup> and the Convention on Nuclear Safety (CNS).<sup>10</sup> There are also two non-binding codes of conduct: Safety of Research Reactors (CCSRR) and Safety and Security of Sealed Radioactive Sources (CCSSRS). Together these codes establish best practice guidelines for the licensing, construction and operation of research reactors and the safety and security of sealed radioactive sources.

In the general domain of nuclear safety, there are several IAEA technical safety standards that provide detailed sets of standards related to legislative and regulatory infrastructures for governing civilian nuclear applications. Similarly, the safety standards that are adopted by the IAEA provide safety fundamentals, safety requirements and safety guides.<sup>11</sup>

### *Nuclear Security Regime*

In contrast with safety concepts, the nuclear security is such a wider subject that entails a broad spectrum of themes like physical protection, emergency preparedness, combating illicit trafficking, border monitoring, nuclear

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<sup>8</sup> The CENNA was adopted in 1986, and require establishment of a notification system for all nuclear accidents with a potential for international trans-boundary release that could potentially be hazardous for another state. It also requires state parties to report all essential details (accident's time, location, radiation release and other data) to assess the situation.

<sup>9</sup> This joint convention was adopted on September 5, 1997, and entered into force on June 18, 2001. It covers spent fuel and radioactive waste resulting from operation of civilian nuclear applications. It also requires planned and controlled releases of liquid or gaseous radioactive materials from regulated nuclear facilities into the environment.

<sup>10</sup> Adopted on June 17, 1994, the CNS was negotiated during a series of expert level meetings from 1992 to 1994. The CNS "aims to legally commit participating states which are operating land-based nuclear power plants to maintain a high level of safety by setting international benchmarks through enhancement of national measures and international co-operation." The most dynamic and unique element of this convention is the process of review meetings, every four years, in which states provide their country reports on the implementation of their obligations for "peer review." The CNS requires each state party to establish and maintain a legislative and regulatory framework and administrative measures related to the safety of civilian nuclear installations.

<sup>11</sup> "Safety Standards," International Atomic Energy Agency, <http://www-ns.iaea.org/standards/default.asp?s=11&l=90&w=1>

material accounting and control and cyber security. In this regard, two basic principles merit a special mention for nuclear security debate: firstly, the nuclear security responsibility rests entirely with that state and it has to ensure security of its nuclear and radioactive materials, associated facilities and referent activities; secondly, each state creates its own nuclear security regime which is appropriate to its peculiar needs.<sup>12</sup> In this backdrop, a national nuclear security regime is comprised of: (1) a legislative and regulatory framework and administrative system measures to govern nuclear security; (2) the institutions and organisations within the state dedicated to ensure implementation of legislative and regulatory framework and administrative systems and (3) Nuclear security systems and measures for prevention and detection of, and response to, nuclear security events.<sup>13</sup>

As regards the international instruments related to nuclear security, the list includes the Convention on Physical Protection of Nuclear Material (CPPNM)<sup>14</sup> and its 2005 Amendment<sup>15</sup> and the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).<sup>16</sup> Additionally, the United Nations Security Council Resolution (UNSCR) 1540<sup>17</sup> and the IAEA's physical protection recommendations in the form of

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<sup>12</sup> International Atomic Energy Agency, *Objective and Essential Elements of a State's Nuclear Security Regime* (Vienna: IAEA, 2013), 1.

<sup>13</sup> IAEA, *Objective*, 13.

<sup>14</sup> The CPPNM, signed in March 1980, is the only international legally binding instrument related to physical protection of nuclear material, which establishes measures related to the prevention, detection and punishment of offenses relating to nuclear material. Its three-fold purposes are: (a) to establish legally prescribed physical protection measures for nuclear material during international transport, (b) to criminalise intentional commission of certain acts related to nuclear material, particularly theft and (c) to promote international cooperation related to prosecution of listed offences and to the response efforts in the event of a security breach.

<sup>15</sup> In 2005, the need for strengthening of the CPPNM was realised and a diplomatic conference was organised to amend the CPPNM. The Amendment, ratified in 2016, additionally obliges member states to protect nuclear facilities and material in peaceful domestic use, storage and transport.

<sup>16</sup> Opened for signature in 2005, the ICSANT obliges state parties to establish offences within the scope of the convention as criminal offences under their national laws and to make these offences punishable by appropriate penalties.

<sup>17</sup> The UNSC Resolution 1540 obliges all its member states to refrain from providing support or assistance to non-state actors seeking to acquire Weapons of Mass Destruction (WMD). The resolution also seeks development and maintenance of measures to account for and secure nuclear material and items, establish appropriate

INFCRIC/225, with its most recent revision five are relevant documents. Furthermore, some supportive initiatives include the Nuclear Security Summit (NSS), Global Initiative to Combat Nuclear Terrorism (GICNT) which, although voluntary in nature, oblige the participating states to enhance nuclear security.

### *Nuclear Liability Regime*

International nuclear liability regime covers various liability mechanisms prescribed in the conventions related to civil liability and damage. Some basic principles related to nuclear liability<sup>18</sup> are covered in almost all liability regimes as follows: the definitions of nuclear installations, nuclear incidents and nuclear damage are very important as they would trigger corresponding national legislation. Regardless of the fault, the operator of a nuclear installation is held solely and strictly liable even if the incident is caused by the events beyond its control such as *force majeure* i.e., ‘an act of God.’ Only certain circumstances<sup>19</sup> exempt the operator from liability. Liability of the operator of a nuclear installation has to be ‘fixed’ and explicitly mentioned in financial terms. Submission of legal claims for liability has to be made within a certain time period. Liability regime must be applied without discrimination to nationality, domicile or residence. Furthermore, only courts of the state in which the nuclear incident occurs, have jurisdiction over liability. There should only be one court in a state with jurisdiction related to a nuclear incident.

At global level, nuclear liability conventions that have been concluded include: (a) the 1963 Vienna Convention on Civil Liability for Nuclear Damage (revised in 1997); (b) the 1997 Convention on Supplementary Compensation for Nuclear Damage and (c) the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.

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physical protection measures, effective border controls as well as national export and trans-shipment controls.

<sup>18</sup> Stoiber et al., *Handbook*, 109-116.

<sup>19</sup> The operator will be exonerated from liability if it is proven, for example, that the nuclear incident was caused directly due to an armed conflict, hostilities, civil war or insurrection, or that it resulted wholly or partly either from gross negligence of the victim or from an act or omission of the victim committed with an intent to cause harm.

### *Nuclear Safeguards and Non-Proliferation Regime*

Non-proliferation/safeguards regime comprehensively covers the IAEA's established safeguards mechanism and non-proliferation arrangements. In order to prevent nuclear proliferation and to allow peaceful uses of nuclear energy, there are a number of the international instrument, both legal and political. These mechanisms also include various political commitments by relevant states, legally binding multilateral treaties, as well as the IAEA safeguards system.

The IAEA safeguards system comprises an extensive set of technical measures to independently verify correctness and completeness of the declarations made by states about their nuclear material and activities.<sup>20</sup> There are three types of IAEA safeguards agreement and two protocols.<sup>21</sup> Beside the Nuclear Non-Proliferation Treaty (NPT) which is a cornerstone of the non-proliferation regime, a number of regional arrangements, called Nuclear Weapons Free Zones (NWFZ)<sup>22</sup> exist, which are considered as strong non-proliferation mechanisms.

Finally, nuclear import and export controls present fundamental regulatory task to prevent unauthorised persons from acquiring sensitive

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<sup>20</sup> Pierre Goldschmidt, "The IAEA Safeguards System Moves into the 21st Century," *Supplement to the IAEA Bulletin* 41, no. 4 (December 1999), <https://www.iaea.org/sites/default/files/41403450122su.pdf>

<sup>21</sup> The list includes the following: (i) comprehensive safeguards agreements (CSAs): all Non-Nuclear Weapons States (NNWS) party to the NPT, as well as states party to the regional NWFZ treaties, are required to conclude CSAs on the basis of INFCIRC/153 (ii) item-specific safeguards agreements with three nuclear weapons states non-party to the NPT. These agreements, on the basis of INFCIRC/66/Rev.2 and its earlier versions, cover only nuclear material, facilities and other items specified in the safeguards agreements; (iii) voluntary offer agreements (VOAs) are for the five NPT Nuclear-Weapon States (NWS) and they cover some or all of their peaceful nuclear activities. Small quantities protocols (SQPs) are signed with states with little or no nuclear activities. In addition, a state with any safeguards agreement may also conclude an Additional Protocol (AP), on the basis of INFCIRC/540, with the purpose of providing wider access and broader information to the IAEA inspectors.

<sup>22</sup> NWFZ: (a) Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty), (b) the South Pacific Nuclear Free Zone Treaty (Rarotonga Treaty), (c) The Southeast Asia Nuclear Weapon-Free Zone Treaty (Bangkok Treaty) and (d) the African Nuclear-Weapon-Free Zone Treaty (Pelindaba Treaty).



material and technology.<sup>23</sup> Some of the international legally binding instrument also stress the importance of import and export controls.<sup>24</sup>

Nuclear law has evolved gradually and significant achievements have been made. However, nuclear business in recent years has seen many dynamic changes also. The Fukushima accident of 2011 temporarily halted nuclear development all over the world. Nonetheless, the concerns of climate change have pushed nuclear energy back into the debate. A large number of states are seeking nuclear power programmes in pursuit of the sustainable and secure source of energy. These embarking states need to establish a legislative and regulatory framework of nuclear law and critical infrastructure, which is a lengthy process and require competencies of all nuclear stakeholders. Role of international organisations, mainly the IAEA, is important here to assist these embarking states in drafting comprehensive national nuclear laws and implementing the requirement of international instruments related to nuclear law. Another issue facing nuclear business is that nuclear activities are multinational, a trend which was not there before. The manufacturer and designer of nuclear power plants may belong to one state and the user to another state. Transportation of nuclear fuel may involve cross-border movements. Not all nuclear power plants are state's enterprise, thus, operating organisation may include multinational corporations. These developments pose many challenges for the nuclear law as domestic law may not apply on the multinational investor. The legislative and regulatory framework may not be compatible with the requirements of multi-stakeholders. These developments may affect legal instruments related to safety, security, liability, safeguards and non-proliferation.

## **Nuclear Law in Pakistan**

Nuclear power, as a source of energy, is not a new concept in Pakistan as it was one of the early users of nuclear energy. Beginning in the 1950s, Pakistan established a number of institutions to oversee nuclear power generation as well as to manage safety and security issues in accordance

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<sup>23</sup> Stoiber et al., *Handbook*, 137.

<sup>24</sup> Article 4 of the CPPNM permits exports and imports of nuclear material only after receiving assurances that the material will be protected at levels described in Annex I to the convention. In addition, Article 27 of the joint convention requires contracting parties to participate in the trans-boundary movement of covered material only when specified conditions are met.

with the IAEA standards.<sup>25</sup> A well-established nuclear regime comprises a sound legislative foundation, regulatory framework, institutional infrastructure, dully supported by technical systems and measures. The Pakistan Atomic Energy Commission (PAEC) Ordinance (1965), Pakistan Nuclear Regulatory (PNRA) Ordinance (2001), Export Control Act (2004) and National Command Authority (NCA) Act (2010) provide the legislative foundation for nuclear energy business in Pakistan.

The National Command Authority (NCA) with Strategic Plans Division (SPD) as its secretariat, supervises all matters pertaining to Pakistan's nuclear programme. PNRA is the competent authority for regulating nuclear safety and radiation protection whereas, the PAEC undertakes activities in the use and application of nuclear energy including research, development, education etc. The PAEC owns and operates all nuclear power plants in Pakistan, therefore, has more than 50 years of nuclear power plant operating experience. As concluded from the findings of the national regulatory reviews and inspections and authenticated by international peer reviews, the safety record of nuclear power plant's operation is admirable.<sup>26</sup>

Pakistan has established a Centre of Excellence for Nuclear Security (PCENS) to impart training in the entire range of relevant activities, which has three main constituents: training academy as central hub, National Institute of Safety and Security (NISAS) at PNRA and nuclear security education segment at Pakistan Institute of Engineering and Applied Sciences (PIEAS).<sup>27</sup> A Strategic Export Control Division (SECDIV) has also been established within the Ministry of Foreign Affairs (MOFA) with the aim to contribute towards non-proliferation and security through effective export management of sensitive goods and technologies.

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<sup>25</sup> Zulfiqar Khan, "Pakistan's Non-Proliferation Policy" in *The Islamisation of Pakistan, 1979-2009* (Washington: Middle East Institute, 2009), 48, <https://www.mei.edu/sites/default/files/publications/2009.07.Islamization%20of%20Pakistan.pdf>

<sup>26</sup> Pakistan Nuclear Regulatory Authority, *Convention on Nuclear Safety Report for the Seventh Review Meeting, 2017* (Islamabad: PNRA, 2017), 2.

<sup>27</sup> Noreen Iftakhar and Sitara Noor, "Nuclear Security Education and Training in Pakistan," *International Journal of Nuclear Security* 3, no. 4 (2017): 31, <http://trace.tennessee.edu/cgi/viewcontent.cgi?article=1037&context=ijns>

### *Establishment of Independent Nuclear Regulatory Body*

As a requirement of the CNS, the national nuclear regulator must be independent in its functions from the nuclear operator. Since inception, the entire nuclear activities in Pakistan were managed by the PAEC. The regulatory mechanism existed within the commission itself. In 1984, the PAEC established the Directorate of Nuclear Safety and Radiation Protection (DNSRP). Thereafter, Pakistan signed the CNS in 1994 to implement the key requirement of the convention; a Pakistan Nuclear Regulatory Board (PNRB) was also created. While this board worked independently, it still remained under the administrative control of the PAEC. Meanwhile, after drafting and acquiring parliamentary approval through the due legal process, PNRA was established through promulgation of PNRA Ordinance 2001.<sup>28</sup> PNRA has three-tiered legal system: (i) Ordinance 2001 issued by the government, which presents basic objectives, concepts and principles of nuclear and radiation safety and protection for the regulation of nuclear technology; (ii) PNRA regulations, which specify safety requirements to ensure nuclear safety and (iii) regulatory guides, that recommend actions, conditions or procedures for meeting the identified safety requirements.

### **National Implementation of Nuclear Law**

In Pakistan, the operator and regulator work in their respective domains to ensure the nuclear business remains safe and secure, in accordance with national laws and international obligations. Regulatory control over the operation of nuclear energy ensures smooth functioning of the operator without causing any safety concerns to the worker, public or environment. The succeeding paragraphs provide a brief description of each component of nuclear law vis-à-vis its implementation.

#### *i. Nuclear Safety Regime*

Pakistan has a comprehensive nuclear safety regime with stringent national regulatory requirements that are in compliance with international instruments related to nuclear safety. Pakistan is a party to the CNS,

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<sup>28</sup> This meant total compliance of the NSC requirements. It was also a unique feature in a region where neighbouring country like India still has not administratively separated its regulatory body.

CENNA and CACNARE. In addition, Pakistan is also following the guidelines of ‘Code of Conduct on Safety of Research Reactors.’ The regulatory framework by PNRA comprehensively covers the entire range of nuclear activities. A complete set of requirements has been defined for safe operation of nuclear installations from its establishment till decommissioning. The licensee is bound to fulfil stringent safety requirements throughout the life cycle of nuclear installations, which start from site registration, construction license, permission for commissioning, permission to introduce nuclear material into the installation, issuance of operating license, revalidation of operating license, licensing beyond design life, license for decommissioning of a nuclear installation or closure of a waste repository. In short, a cradle to grave safety cycle is maintained that ends at removal from regulatory control.

Similarly, being the operator of nuclear installations, the PAEC has also established a Nuclear Safety Policy. The policy provides safety rules, procedures and other requirements that operator is following to ensure nuclear safety in Pakistan.<sup>29</sup> The regulatory framework adopted by PNRA has been widely appreciated at the international level. In 2014, the Integrated Regulatory Review Service (IRRS) mission of the IAEA concluded that PNRA has a well-established regulatory and legal framework that is based on the IAEA safety standards. Mission also stated that PNRA conducts effective regulatory activities for nuclear power plants, including licensing, inspection and enforcement.<sup>30</sup>

## *ii. Nuclear Security Regime*

Pakistan has well established nuclear security regime.<sup>31</sup> The essentials of nuclear security in Pakistan include an effective command and control system under the NCA, rigorous regulatory regime, comprehensive

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<sup>29</sup> Pakistan Nuclear Regulatory Authority, *Convention on Nuclear Safety Report for the Seventh Review Meeting, 2017* (Islamabad: PNRA, 2017), 63.

<sup>30</sup> “IAEA Mission Concludes Peer Review of Pakistan’s Nuclear Regulatory Framework,” IAEA, May 2014, <https://www.iaea.org/newscenter/pressreleases/iaea-mission-concludes-peer-review-pakistans-nuclear-regulatory-framework>

<sup>31</sup> During the IAEA’s second Ministerial Nuclear Security Conference in December 2016, Pakistan’s Ministry of Foreign Affairs has published a brochure outlining a detailed picture of Pakistan’s nuclear security regime.

export controls and extensive physical protection measures.<sup>32</sup> The IAEA's Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5) is being used as a regulatory tool for assessing physical protection of nuclear power plants. In addition, the IAEA 'Code of Conduct on Safety and Security of Radioactive Sources' is a guideline for regulating safety and security of radioactive sources.

PCENS, with its organs, constitute as an essential element of nuclear security regime. PCENS, NISAS and PIEAS, working together in harmony, are imparting education and training in various areas of nuclear security and physical protection.<sup>33</sup> Pakistan has equipped designated country's entry/exit points with radiation detection equipment to prevent illicit trafficking of nuclear and other radioactive materials. Furthermore, an integrated Cargo Container Control (IC-3) facility is also functional at Port Qasim near Karachi since 2007, which is in compliance with the Container Security Initiative (CSI).

For detection and initial response to any nuclear security incidents, Pakistan is equipping its response organisations with radiation detection equipment. This has been done as a part of national detection architecture. Similarly, for a response to nuclear security events, a Nuclear Emergency Management System (NEMS) has been put in place with Nuclear and Radiological Emergency Support Centre (NURESC) as the implementing arm of NEMS. In addition, to coordinate the response to nuclear accidents or radiological emergencies, both nationally and abroad, a National Radiation Emergency Coordination Centre (NRECC) has been established. NRECC is also a focal point for Pakistan's obligations under CENNA and CACNARE.

Pakistan acceded to CPPNM in 2001 and ratified its amendment in March 2016. It is also abiding the best practices of 'Code of Conduct on Safety and Security of Sealed Radioactive Sources' since 2004. Pakistan voluntarily participates in NSS Process and continues to contribute to the GICNT and the IAEA's Incident and Trafficking Data Base (ITDB). Five

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<sup>32</sup> "Statement by Foreign Secretary Aizaz Ahmed Chaudhry at the International Conference on Nuclear Security: Commitments and Actions," IAEA, December 2016, [https://www.iaea.org/sites/default/files/16/12/pakistan\\_statement\\_final\\_dec\\_2016.pdf](https://www.iaea.org/sites/default/files/16/12/pakistan_statement_final_dec_2016.pdf)

<sup>33</sup> "Pakistan's National Statement Nuclear Security Summit," Ministry of Foreign Affairs, April 4, 2016, <http://www.mofa.gov.pk/chile/pr-details.php?prID=3604>

national reports have been provided to the UN's 1540 Committee which carries details of measures taken to support the objectives of the UNSCR 1540.

*iii. Nuclear Liability Regime*

PNRA Ordinance of 2001 empowers enactment of regulation(s) for civil nuclear liability. PNRA ordinance corresponds to the civil nuclear liability in the following manner: the section 30 requires PNRA to fix the extent of civil liability for an operator; whereas, section 32 requires the operator of a nuclear installation to maintain adequate insurance to cover civil liability in such amount and terms determined by PNRA. Since the operation of nuclear power in Pakistan is state-owned, sections 33 and 34 of PNRA ordinance requires the federal government to assume limited civil liability for installations owned and operated by it, up to an amount to be determined by PNRA. Consequently, PNRA has determined civil liability in financial terms and communicated it to the operator. Together with federal government, the PAEC is abiding by the requirements of civil liability under the licensing conditions defined by PNRA.

*iv. Nuclear Non-Proliferation and Safeguards Regime*

Pakistan has stringent import and export control mechanism. It has established inclusive legislative, regulatory and implementation system to regulate the transfer of sensitive goods and technologies while ensuring their safety and security at various stages. Export Control Act on Goods, Technologies, Materials and Equipment related to Nuclear and Biological Weapons and their Delivery Systems Act – 2004 provide a legislative basis for controls on the export of sensitive technologies particularly related to nuclear and biological weapons and their means of delivery. Furthermore, lists of goods and technologies subject to regulatory controls, known as Control List (CL), were published in 2005 and revised in 2011, 2015 and 2016.<sup>34</sup> These lists are consistent with the scope of international non-proliferation regimes. For administration of export controls in Pakistan SECDIV was established in 2007 at MOFA. An Oversight Board was also set up to monitor implementation of the Export Control Act 2004 and

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<sup>34</sup> “Pakistan Notifies Revised Control Lists Regarding Nukes,” *Daily Times*, January 11, 2017.

functioning of SECDIV. SECDIV has also issued Export Control Licensing and Enforcement Rules<sup>35</sup> and Policy Guidelines on Strategic Export Controls.

Furthermore, PNRA regulations PAK/908 require that any licensee, desirous of importing or exporting any radiation generating or radioactive material must apply to PNRA for the grant of No Objection Certificate (NOC) subject to the existing import and export policies issued by the Ministry of Commerce. An NOC from SECDIV is also required for all items that falls under the preview of the Export Control Act 2004.<sup>36</sup>

All civilian nuclear installations are under the IAEA item-specific safeguards agreement. The following table provides the details as below:

**Table No. 1**  
**Pakistan’s Safeguards Agreements with IAEA**

Sr.No	Facility	IAEA Publication	Date of Signing
1.	Pakistan Research Reactor-I (PARR-1)	INFCIRC/34	March 5, 1962
2.	Karachi Nuclear Power Plant (KANUPP)	INFCIRC/116	June 17, 1968
3.	Fuel Reprocessing Plant	INFCIRC/239	March 18, 1976
4.	Hawks Bay Depot	INFCIRC/248	March 2, 1977
5.	Pakistan Research Reactor 2 (PARR-2)	INFCIRC/393	September 10, 1991
6.	Chashma Nuclear Power Plant-1 (C-1)	INFCIRC/418	February 24, 1993
7.	Chashma Nuclear Power Plant-2 (C-2)	INFCIRC/705	February 22, 2007
8.	Chashma Nuclear Power Plant- (C-3& 4)	INFCIRC/816	April 15, 2011
9.	Karachi Nuclear Power Plant-Units 2 & 3	INFCIRC/920	May 3, 2017

<sup>35</sup> Ministry of Foreign Affairs, *Export Control (Licensing and Enforcement) Rules* (Islamabad: Ministry of Foreign Affairs, 2009).

<sup>36</sup> Government of Pakistan Ministry of Commerce, *Export Policy Order 2016* (Islamabad: Ministry of Commerce, 2016), 11.

Nuclear law in Pakistan is being implemented since the establishment of nuclear power programme. Institution and organisation responsible for implementation of legislative and regulatory framework are working in their domains to make safe and secure use of nuclear technology for peaceful purposes. Pakistan is the only country in South Asia where the nuclear regulator is administratively and financially independent from the operator. Institutions are built to provide a competent and professionally qualified workforce. However, taking energy expansion plans into account, there is a need to maintain and enhance organisational capabilities of the operator and regulator. Furthermore, the sustainability of human resource development for operation and maintenance of nuclear installations is required. Both of these necessitate extensive international cooperation.

### **Challenges and the Way Forward**

International nuclear law is flexible in providing state parties adequate freedom to develop and devise their own legislative and regulatory framework in view of their unique characteristics and requirements. Furthermore, possible trans-boundary consequences of nuclear incidents allow state parties to consider international cooperation for the implementation of nuclear law instruments.

*At International Level:* The international framework for peaceful uses of nuclear technology has been strengthened since the Chernobyl accident with many legal and practical attainments. However, there remain some challenges to international nuclear law.

*Remaining Apace with Technological Developments:* The basis of nuclear law is nuclear technology which affected by rapid technological advancements. Therefore, adjustment to the technological advancements remains a continuous challenge to the international as well as national nuclear law.

*Reactive Regime:* History depicts that nuclear accidents played a major role in the evolution of nuclear law. Thus, the reference to nuclear law is being “reactionary” as most of the safety or emergency preparedness arrangements were adopted in the post-Chernobyl period. The two guidelines adopted by the IAEA, detailing procedures to be implemented during the nuclear accident were quickly replaced by the ‘Early Notification



Convention’ and the ‘Assistance Convention.’<sup>37</sup> Thereafter, in the post-Fukushima period, strengthening existing gaps in the ‘CNS’ is in the offing. Nevertheless, these accidents lead to enhance understanding the discrepancies in the existing arrangements and urge greater international cooperation considering the trans-boundary consequence of any nuclear accident.

*Emerging Nuclear Security Threats:* Nuclear security threats may be increasing with innovative destructive notions employed by non-state actors. With its 2005 Amendment, CPPNM has an increased list of acts to be declared as offences due to a wider scope of the convention. Therefore, further amendment to this convention may be needed, in view of prevailing and emerging nuclear security threats, at some point in the future. Thus, legal instruments for nuclear security need to adjust to address such challenges.

*Duplication of Nuclear Security Efforts:* Contrary to nuclear safety which has institutionally evolved, nuclear security in its development phase has seen many voluntary trends. Promotion of nuclear security remained in the wish list of many individual countries and eminent persons. This trend is creating overlaps and duplication of nuclear security efforts. These unilateral or bilateral approaches for nuclear security need to be discouraged. Individuals based initiative does not have a lasting impression due to wider acceptability and endorsement. Sustainability of nuclear security may be propagated with consensus based approach. Consensus will lead to greater cooperation amongst states as they are reluctant to cooperate for nuclear security due to confidentiality/sensitivity of information issues.

*Intrusive Nature of Safeguards:* The increasingly intrusive nature of safeguards regime has brought criticism to the IAEA’s role. The IAEA safeguards system has evolved through many stages. From classic facility type safeguards to comprehensive ones and Additional Protocol mechanisms, the IAEA are continuously strengthened its safeguards system.

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<sup>37</sup>Johan Rautenbach, Wolfram Tonhauser and Anthony Wetherall, “Overview of the International Legal Framework Governing the Safe and Peaceful Uses of Nuclear Energy – Some Practical Steps” in *International Nuclear Law in the Post-Chernobyl Period* (Paris: Nuclear Energy Agency, Organisation for Economic Co-operation and Development, 2006), 9.

Through the new notions of “Integrated Safeguards”<sup>38</sup> or “State-level Safeguards,”<sup>39</sup> which is being considered as a progression from mechanistic to intelligence safeguards.<sup>40</sup> Some IAEA member, like Russia, argued that by implementing state level safeguards, the IAEA would make more political and subjective judgments about the state.<sup>41</sup> Such concerns by member states are serious. The IAEA should find plausible ways to remove such criticism.

*Ignoring Strategic Ground Realities:* Lastly, the non-proliferation regime, particularly the NPT, which is considered as the cornerstone of the non-proliferation regime appear to be ignoring ground realities. The widening divide between the ‘haves’ and ‘have nots’ of the nuclear world, non-translation of ‘good-faith’ are case in point. Also important is the challenge of integrating the non-NPT states that have nuclear weapons but are not amongst the “NPT’s legally defined nuclear weapons states.” Non-proliferation regime requires either adjustment or up-gradation in view of prevailing strategic realities.

*At National Level:* The analysis of Pakistan’s case study clearly identifies that the country’s adherence to and implementation of international nuclear law is in conformation with the international standards and norms. In each component of nuclear law, Pakistan has made steady progress, either through developing and maintaining its own domestic

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<sup>38</sup> In 2002, the conceptual framework known as integrated safeguards was presented to the IAEA board. Within this framework, the IAEA took into account state-specific characteristics and features and all other safeguards-relevant information available to it about the state concerned and, in consultation with the state, developed a customised state-level integrated safeguards approach.

<sup>39</sup> The term ‘State-level concept’ was first introduced to the Board of Governors in the Safeguards Implementation Report (SIR) for 2004 to describe safeguards implementation that is based on state-level approaches developed using safeguards objectives common to all states with CSAs and taking state-specific factors into account. See “The Conceptualisation and Development of Safeguards Implementation at the State Level,” Report by the Director General, GOV/2013/38, <http://www.isisnucleariran.org/assets/pdf/GOV201338.pdf>

<sup>40</sup> Victor Bragin, John Carlson and Russell Leslie, “Integrated Safeguards: Status and Trends,” *The Non-Proliferation Review*, (Summer 2001):108.

<sup>41</sup> Laura Rockwood, “The IAEA’s State-Level Concept and the Law of Unintended Consequences,” *Arms Control Today* (August 2014), [https://www.armscontrol.org/act/2014\\_09/Features/The-IAEAs-State-Level-Concept-and-the-Law-of-Unintended-Consequences](https://www.armscontrol.org/act/2014_09/Features/The-IAEAs-State-Level-Concept-and-the-Law-of-Unintended-Consequences)

nuclear laws or by complying with requirements of international instruments. Nevertheless, some challenges still remain that are neither related to compliance nor to implementation. These are as follows:

- i. **Limited Nuclear Law Expertise:** There is a limited expertise related to international nuclear law in Pakistan. With such instruments full of technical or legal jargons, a technical person or a legal expert cannot fathom the requirements of international nuclear law. Furthermore, there are international relations aspects to these instruments due to political or strategic significance. To remove this capacity-building shortcoming, a two-pronged strategy may be adopted: in the short run, a combination of technical, legal and international relations experts may evolve better understanding and give technical, political, strategic as well as legal advice for the better implementation of international instruments related to nuclear law. Thus, at the national institutional level, a 'Treaty Cell' may be established in nuclear related organisations with a team of technical, legal and IR experts. In the longer run, there would be a need to provide a baseline at the academic level like 'Introduction of International Nuclear Law' as a separate discipline in major public and private sector universities' law departments.
- ii. **Projection of Pakistan's Adherence and Implementation Accomplishments:** While Pakistan is adhering to and implementing all important instruments of international nuclear law, there is little or no propagation at national or international level. The IAEA is assisting Pakistan in developing and strengthening its capacity building related to nuclear safety and security. However, less promoted are Pakistan's non-monetary contributions to the IAEA and its member states. These non-monetary contributions include resource person in international training courses and workshops, consultancy services, participation as technical experts in the IAEA sponsored peer review and advisory missions. These impactful services require dissemination at the international level. Similarly, beside state party to legal international instruments related to nuclear law, Pakistan is actively participating in different voluntary mechanisms which are not much emphasised. Thus, Pakistan's adherence and implementation achievements need to be highlighted better. All the possible national and international forums must be

utilised to project strong legal and regulatory credentials of Pakistan's civil nuclear programme.

## **Conclusion**

Nuclear law as a subset of international law has evolved over a passage of time. With its purpose of protecting individuals, property and environment from harmful effects of radiation, nuclear law provides a legal framework for conducting nuclear related activities. The four main components of nuclear law are nuclear safety regime, nuclear security regime, nuclear liability regime and safeguards and non-proliferation regime. There are various legal binding instruments, voluntary commitments, technical standards and administrative mechanisms under these four regimes. Nuclear safety regime is as old as nuclear technology itself is, thus, it has wider acceptance. Much work has been done to employ nuclear safety.

However, the new trends associated with the development of new nuclear power programmes and nuclear globalisation need to be catered in existing or future legal instruments of nuclear law. Nuclear security regime is comparatively a new field of nuclear law. Taking into account the confidential nature of nuclear security arrangements, states are reluctant to cooperate with each other. Nonetheless, efforts for strengthening nuclear security should be centralised and channelised. Various liability instruments have been developed as nuclear accidents are trans-boundary in nature particularly when there is a chance of offsite radioactive releases. Fukushima accident renewed the debate of nuclear liability. The role of nuclear safeguards has been very important to prevent nuclear weapons proliferation. However, the increasingly intrusive nature of the safeguards regime and its use for pursuing any particular objective is making this regime more controversial.

After the analysis of the international legal framework for peaceful uses of nuclear technology, it is safe to conclude that significant achievements have been made by the IAEA and other international entities to evolve effective international instruments to manage the technology that is inherently dual. Facilitating international cooperation among states using nuclear technology for peaceful purposes is, thus, the prime feature of such legal instruments mainly due to concerns of trans-boundary effects of any

nuclear accidents like Chernobyl and Fukushima. Nevertheless, some challenges still needed tracking.

Nuclear law has to keep a pace with technological developments which are happening around the globe. There are many discrepancies in existing instruments under nuclear law hence plugging in gaps required. Furthermore, there is a need to explore synergies in nuclear security regime as there are many overlapping obligations. In the backdrop of emerging nuclear security threats, equally important is the need of updating nuclear security laws and regulations. To implement and act effectively, state's reservations or concerns regarding the increasingly intrusive nature of the safeguards regime has to be removed. The nuclear non-proliferation regime has to keep in account the revolving strategic environment.

At the national level, Pakistan has employed effective legislative and regulatory framework that is in line with international nuclear law and national needs. The dedicated independent regulatory body is functional to ensure the operator's compliance with national laws and international obligations. National institutions are being built with state-of-the-art systems and measures to ensure safe and secure use of nuclear technology. Effective import and export controls exist to ensure nuclear non-proliferation. Safeguards are in place at all civilian nuclear installations. Pakistan is a state party to all important instruments related to nuclear law and effectively implementing its commitments under the international voluntary mechanism. Its nuclear safety records and regulatory practices are applauded internationally. More time will allow development of expertise for international nuclear law both at institutional as well as at academic levels. Lastly, Pakistan is in dire need for projection and narrative-building related to achievements in its civil nuclear programme and the contribution towards strengthening nuclear safety and security at national and international level.