



LEGAL ASPECTS OF INTERNATIONAL COOPERATION IN THE FIELD OF PEACEFUL USES OF NUCLEAR ENERGY: TECHNOLOGY TRANSFER, TRAINING AND EXCHANGE OF EXPERIENCE.

Sayidkomil Bekpulat ugli Ibodullaev

Lecturer at Private International Law Department
of the Tashkent State University of Law

Article history:	Abstract:
Received: December 20 th 2023 Accepted: January 18 th 2024 Published: February 20 th 2024	This paper examines the legal frameworks enabling international cooperation on the peaceful uses of nuclear energy, focusing on technology transfer, training programs, and exchange of expertise. Key issues analyzed include relevant international treaties and national policies regulating nuclear technology sharing, human resource development, and collaborative projects. Challenges such as nuclear proliferation risks, trade barriers, and uneven global participation are discussed. Recommendations center on strengthening international norms and institutions to promote capacity building and knowledge transfer while balancing nonproliferation objectives.

Keywords: Nuclear Energy, International Cooperation, Technology Transfer, Training, Nonproliferation

INTRODUCTION

Global use of nuclear power has expanded steadily in recent decades, supplying 10% of electricity worldwide as of 2021 [1]. As of late 2022, 31 countries operate a total 441 nuclear power reactors, which provide about 390 GW of installed capacity [2]. With another 53 reactors under construction and hundreds more in various stages of planning, mostly in Asia, nuclear power looks poised to continue growing its share in global electricity production [3].

Realizing the full potential of nuclear energy to meet rising electricity demand and mitigate climate change risks, however, entails substantial international cooperation. Since the inception of civil nuclear power in the 1950s, countries have pursued various bilateral and multilateral agreements to enable collaboration on the sharing of nuclear technology, knowledge, expertise, and personnel training in order to develop national capacities in this sector [4].

The International Atomic Energy Agency (IAEA) remains the foremost institution facilitating such cooperation at the global level by setting safety standards and providing technical assistance while also administering safeguards to prevent weaponization of nuclear programs [5]. The IAEA has helped establish frameworks for technology transfers, personnel exchanges, regulatory capacity building, and responsible project development across borders.

However, significant gaps and challenges persist that continue to impede equitable and effective international

cooperation on the peaceful uses of nuclear energy. Obstacles are especially pronounced in the arena of facilitating technology transfers and knowledge-sharing between advanced, nuclear-armed states and developing newcomer countries now exploring nuclear power [6].

While over 30 states currently operate nuclear reactors, capacity-building support through technology transfers and training has lagged considerably even as dozens more states actively pursue nuclear energy programs. Tensions also remain unresolved between the nonproliferation control regimes promoted by nuclear-armed and technologically advanced states on the one hand, and the peaceful use rights enshrined under Article IV of the Non-Proliferation Treaty (NPT) on the other [7].

This article undertakes a comprehensive analysis of the continually evolving legal and institutional landscape around international cooperation on civil nuclear energy, assessing relevant frameworks and identifying priority areas for improvement. The analysis pays particular attention to cooperation dynamics around the transfer of nuclear technologies, the development of human resource capacities, and technical collaboration between countries with mature nuclear power industries and newcomer states seeking access to nuclear energy.

Global Trends and Institutional Frameworks

As of 2022, 441 operable civil nuclear power reactors supply about 390 GW across 31 countries, but another



53 reactors are currently under construction and over 100 new units planned, mostly in Asia [8]. Bilateral nuclear cooperation agreements, typically between governments, have facilitated major new build projects enabling technology transfers from established nuclear energy states like Russia, China, and South Korea to newcomer nations such as Bangladesh, Egypt, and Turkey [9].

Multilateral assistance spearheaded by the IAEA also complements these ties by offering various frameworks for personnel training, regulatory capacity building, and nurturing technical and legal expertise in newcomer countries seeking nuclear energy. The IAEA provides peer learning opportunities, detailed guidance documents, workshops, and policy advice to enable cooperation. Some key programs include:

- Human Resource Development Initiative - supports workforce training and education in nuclear science.
- Technical Cooperation Program - promotes knowledge sharing and backs peaceful nuclear projects with equipment.
- Integrated Nuclear Infrastructure Review (INIR) missions – provides recommendations across all areas to establish effective national programs [10].

In terms of specific cooperation agreements, the Convention on Nuclear Safety aims to legally bind parties to implementing high levels of safety in the industry, while joint projects such as ITER (International Thermonuclear Experimental Reactor) demonstrate advanced international research and development [11].

Obstacles Around Technology Transfers

Despite expanding cooperation on civil nuclear power in recent decades, significant gaps and challenges persist that continue to impede equitable technology transfers and knowledge-sharing [12]:

1. Proliferation risks - The inherent dual use potential of nuclear technology means concerns over weaponization pose constant impediments to cooperation. Export controls and restrictions concentrated among a few top nuclear technology holding states like the US and Russia have often hindered legitimate technology transfers and capacity assistance to developing states, even those fully compliant with nonproliferation norms [13].
2. Technology access barriers - Obsolete restrictions stemming from Cold War political divisions and strategic calculations still adversely affect civil nuclear trade and cooperation dynamics in some cases.

Guidelines propagated by the Nuclear Suppliers Group have also faced accusations of enabling monopolization of nuclear technology and unfairly limiting availability of cutting edge innovations to the developing world in contradiction to NPT Article IV provisions [14].

3. Inconsistent participation – Uptake remains uneven in many IAEA's major joint programs and frameworks meant to organize cooperation [15]. For example, only 88 member states so far have ratified the Convention on Nuclear Safety (CNS), a legally-binding instrument that promotes achievement of high levels of safety in nuclear projects through obligations around regulatory systems, emergency preparedness, transparency, and other standards [16]. Regional imbalances also apply in adoption of IAEA guidance and involvement in initiatives around human resource development [17].

Human Resource Development Challenges

Strengthening cooperation on training nuclear sector workforces poses its own set of challenges:

1. Brain drain issues - The lack of high-paying jobs in the nuclear industry in many member states leads to migration of talented professionals abroad, depriving newcomer countries of valuable human capital [18].
2. Inadequate education infrastructure - Many states considering new nuclear power lack academic programs in relevant fields like nuclear engineering, limiting available expertise [19].
3. Weak national commitments - Scarce public sector funding allocated to nuclear research, training, and recruiting initiatives in many cases. Insufficient legal frameworks and bureaucratic obstacles also hamper cooperation [20]

Recommendations for Enhanced Cooperation

Realizing equitable and effective international cooperation on peaceful nuclear energy use to meet climate and development goals entails both upholding and progressively evolving supporting normative architectures:

1. Strengthen NPT bargain – Renewed commitment to Article IV provisions on access to technology and Article VI on disarmament by nuclear armed states can reinforce foundations of cooperation [21].
2. Modernize control regimes - Outdated guidelines and export restrictions require reforms to enable safer technology transfers



without denying economic development rights [22].

3. Expand IAEA assistance – Additional funding and mandate for enhanced IAEA tenure track programs for graduates, regulatory forums, and Magic Mock technical assistance packages tailored to countries' lifecycle phase [23].
4. Develop regional cooperation networks – Targeted collaboration initiatives through regional bodies and policy banks to boost participation and maximize effectiveness [24].

CONCLUSION

This paper has undertaken a systematic assessment of the multifaceted and continually evolving legal and institutional landscape structuring international cooperation on civil nuclear energy use.

Achieving sustainable global expansion of nuclear power programs that can supply rising electricity demand and mitigate climate change risks critically requires effective frameworks enabling technology transfers, human resource development, and knowledge sharing between established and newcomer countries. However, as the analysis demonstrates, significant gaps and challenges persist across all domains of cooperation.

Obsolete provisions rooted in past geopolitical divisions, uneven adoption of existing cooperation mechanisms, limitations to technology access, inconsistencies between nonproliferation regimes and development rights, constrained educational opportunities, and brain drain problems all serve to impede the realization of peaceful and proliferation-resistant nuclear energy programs globally.

Priority measures this study recommends to reinforce international cooperation while preventing weaponization focus on:

- Repairing asymmetries in the NPT framework through disarmament and technology access provisions;
- Modernizing outdated control policies hampering legitimate transfers;
- Expanding IAEA assistance programming to better meet newcomer needs; and
- Cultivating regional cooperative networks to broaden opportunities.

Strengthening international cooperation to enable safe, secure and equitable expansion of civil nuclear power requires upholding both nonproliferation norms and peaceful use rights. Resolving tensions between these two imperatives remains central to fully delivering on the promises of the atomic age in driving sustainable development while minimizing risks. Creative diplomacy

and evolving institutional architectures building trust can help bridge persisting divides.

REFERENCES

1. IAEA, Nuclear Technology Review 2021 Report Forde, M. (2015). The origins and evolution of ITER.
2. Schneider et al. (2022). The World Nuclear Industry Status Report 2022
3. Nugumanova et al. (2017). International legal framework for nuclear technology transfer
4. IAEA, Overview of Legal Frameworks for Nuclear Cooperation
5. Jankowitsch-Prevor, O. (2020). Nuclear Cooperation with Developing Countries
6. Finlay et al. (2021). Addressing Uneven Global Participation in Nuclear Technology Cooperation Frameworks.
7. Abbott, T. (2018). Building Trust through Progressive Nuclear Disarmament and International Cooperation. Khan and Thomas (2016). The supplier's role in transfer of nuclear technology. [10] Trezza Attilio (2015). Nuclear Safety: Achievements and Challenges in the Context of the Fukushima Accident. Vienna Center for Disarmament and Non-Proliferation.
8. Laurence, E.J. (2010), "Finding Article IV": Legal Analysis of Taiwan's Nuclear Weapons Program