Int Environ Agreements (2021) 21:647–667
https://doi.org/10.1007/s10784-021-09539-2

ORIGINAL PAPER

International nuclear energy legal regulation: comparing the experience of the EU and the CIS countries

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Accepted: 17 May 2021 / Published online: 22 May 2021

Abstract
The world community recognizes the enormous potential danger posed by nuclear power, including accidents at nuclear industries and atomic infrastructure facilities, the possibility of using nuclear technologies for criminal purposes. At the same time, immediate rejection of the use of nuclear technologies can create incomparably greater harm to both humans and the environment. In the context of many countries' transition to a low-carbon economy, nuclear energy is assigned a special role. The subject of this study is political and legal prerequisites for expanding legal regulation in the field of nuclear energy. Using the method of political and legal analysis, the study considers modern international initiatives in legal regulation of nuclear energy. In addition, the work touches on the issue of the relationship between nuclear law and private international law in the context of the possibility of expanding the latter. The study suggests that in the near future, the expansion of nuclear energy legal regulation at the EU and CIS level will be carried out mainly with the help of soft law acts, as well as bilateral treaties concerning the technical aspects of nuclear infrastructure facilities. In practical terms, this study is of interest to lawyers in the field of public international, private international, and energy law.

Keywords Climate change · Decarbonization · Green technologies · Nuclear energy · Scientific and technical cooperation

1 Introduction

Nuclear energy is the single largest source of carbon-free energy today, avoiding billions of tons of oxocarbon emissions. Today in the world, there are approximately 440 nuclear reactors operating in 30 countries, and in the next 15 years, other 300 reactors are expected to appear around the world. Nuclear power will undoubtedly be among the

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main sources of energy and the engine of the economy for many decades to come. In addition to providing clean and reliable electricity, nuclear energy will also continue to play a key role in energy security, job creation, and export opportunities for all countries with the appropriate capacity (Office of Nuclear Energy 2020).

At the same time, in addition to the significant contribution of nuclear energy to the world community, there are a number of issues related to the non-proliferation of nuclear technologies, safety, and environmental protection, to resolve which the world community must work together (Katsuba et al. 2021). The global nature of nuclear energy, both in terms of its benefits and challenges, illustrates why strong international cooperation in this area is critical (Atomic Energy 2.0. 2020b).

The idea put forward by the ministers of European states in 1955 to create a supranational regional organization that would allow joint efforts to develop nuclear energy for the economic revival of post-war Europe was embodied in the creation of the European Atomic Energy Community. In the days leading up to the creation of the EU, sustainable development of the European Community was impossible without the production of large quantities of cheap energy. To a large extent, this factor persists to this day (Kawashima 2016).

Sweden, Hungary, and Lithuania are showing a growing commitment to switching to safe renewable energy sources. However, some other EU countries (in particular France) intend to continue to extract energy from nuclear fission or fusion (Embling 2018).

The opinion that nuclear energy hardly contributes to climate change is shared by the CIS countries, which, on the contrary, are striving to develop the nuclear industry in the future. In particular, for Russia, the development of nuclear energy can be attributed to the uncontested political and strategic goals. However, the popularity of nuclear energy is very unstable since any accident can provoke antipathy toward the industry, which is demonstrated by the experience of Germany, which abandoned the prospects for nuclear energy production, in particular, because of the Fukushima nuclear disaster (Cherp et al. 2017).

Taking into account the importance of ensuring safety and reliability of the global nuclear energy system, it should be understood that this issue is only one of the sides of international cooperation in providing countries with nuclear electricity, which is carried out at least at three levels. The first level is global, on which international organizations and supranational structures operate. The second is national, where at the level of intergovernmental agreements, interaction of states in the field of nuclear energy is carried out. The third is a micro-level, the level of economic entities, at which scientific, technical, and humanitarian international cooperation in the field of nuclear energy takes place. The efficiency of world nuclear energy depends on well-established international cooperation at all three levels (Panteley 2017).

Modern studies considering legal regulation in the field of nuclear energy, concerning the experience of the EU and CIS countries, are devoted to such issues as:

- analysis of the relationship between sustainable development and social responsibility (Al-Masri and Al-Assaf 2020);
- innovative development of the power industry and its role in ensuring country's energy security (Kozlov and Zakharov 2015);
- features of international cooperation in the field of nuclear energy (Panteley 2017);
- assessment of the role of the International Atomic Energy Agency (IAEA) in world politics in the period after the end of the Cold War (Roehrlich 2016);
- the role of nuclear energy resources in the foreign policy of states (Kuteleva 2020);

- assessment of renewable and nuclear resources for electricity production in Kazakhstan (Ahmad et al. 2017);
- policy in relation to renewable energy sources in Kazakhstan and Russia (Koch and Tynkkynen 2019);
- legal regulation of nuclear energy in Kazakhstan (Lizikova 2017);
- assessment of differences in the use of low-carbon sources of electricity by comparing the evolution of nuclear, wind, and solar energy in Germany and Japan (Cherp et al. 2017);
- prospects for the regulation of nuclear energy in France (Mauger 2018; Perez et al. 2020);
- consideration of nuclear law as a branch of international law (Ioyrysh and Fatyanov 2014; Lysenko 2017).

It should be noted that to date, there, in general, are no comprehensive studies on the issue of expanding international nuclear energy legal regulation and, in particular, the international legal regulation of liability for nuclear damage (including, but not limited to the issue of applicability of the norms Vienna Convention on Civil Liability for Nuclear Damage, Convention on Supplementary Compensation for Nuclear Damage, Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency) considering this issue generally, and in the conditions of the post-Soviet states particularly. Par excellence, this applies to the aspects of expanding this sphere of legal regulation to the sphere of private international law. This study, designed to fill this gap, examines precedents and challenges in the existing area of regulatory and legal regulation. The study aims to answer the question of the direction in which the scope of international legal regulation in the field of nuclear energy is being expanded against the background of international and regional initiatives in this area.

The question of whether international law sufficiently regulates legal relations in the nuclear industry determines the relevance of this study. The subject of this study is an assessment of the political and legal prerequisites for expanding nuclear energy legal regulation.

2 Materials and methods

This study is based on an analysis of international legislative acts:

- Convention on Nuclear Safety;
- Convention on the Physical Protection of Nuclear Material;
- Nuclear Terrorism Convention;
- Paris Convention on Third Party Liability in the Field of Nuclear Energy;
- Vienna Convention on Civil Liability for Nuclear Damage;
- Convention on Supplementary Compensation for Nuclear Damage;
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

The study also considers EU legislation:

- European Atomic Energy Community (Euratom) Treaty 1957;

- Council Directive 2009/71/Euratom establishing a community framework for the nuclear safety of nuclear installations;
- Council Directive 2014/87/Euratom amending Directive 2009/71/Euratom;
- Energy Efficiency Directive 2012/27/EU.

The CIS regulatory and legal documents were also studied:

- Agreement of the CIS member states on the approximation of approaches to legal and technical regulation, conformity assessment, standardization, accreditation, and metrological support in the field of peaceful use of atomic energy;
- Framework Program for Cooperation between the CIS member states in the field of atomic energy use for the period up to 2020 "Atom-CIS cooperation" dated May 19, 2011;
- Agreement on the coordination of CIS interstate relations in the field of peaceful atomic energy use dated May 31, 2013.

OECD Paper "The Costs of Decarbonisation: System Costs with High Shares of Nuclear and Renewables" was analyzed as well.

Using the method of political and legal analysis, the study examines political initiatives and promising directions of legislative regulation in the field of nuclear energy, comparing the experience of the EU and the CIS countries that have the appropriate technologies. To achieve the objectives of the study, it was decided to assess the role and place of nuclear energy among other energy resources against the background of the growing trend of global environmental policies toward decarbonization.

3 Results

International relations are undergoing significant changes in the context of globalization, the redistribution of forces and priorities in the geopolitical arena, as well as transformations in the field of world politics and economics. Quite often, modern studies note a decrease in the role of international organizations (Gardiner 2007; Greer et al. 2018). In particular, over the past decades, there has been a decline in the role of the UN in international politics as a real center for decision making, and the effectiveness of its mechanisms has been criticized (Gardiner 2007). Even as a platform for discussion, the prospects for the largest international organization seem contradictory. The same goes for the role of other international organizations, such as the Parliamentary Assembly of the Council of Europe (PACE) or the World Trade Organization (WTO) (Greer et al. 2018; Sattler et al. 2014).

Such changes, in turn, affect the sphere of legislative regulation of nuclear energy (Pobedinsky and Shestak 2020; Roehrlich 2016).

At the same time, within the framework of the implementation of international political and economic initiatives, it is less and less common to see decisions of individual states that do not agree with the opinion of the world community, or, at least, regional geopolitical players (Anisina et al. 2021). In this context, one can also consider the activities of the IAEA, which is the largest and most influential international organization in the field of nuclear energy and is characterized by the same challenges as other international organizations. At the same time, the effectiveness of its work is usually assessed highly, which, in particular, is due to the relatively small number of states that have the appropriate

technologies and increased control from all interested parties. Increased control is associated with the need to prevent the spread of technologies in the field of nuclear energy and to prevent the development of all kinds of negative scenarios at nuclear infrastructure facilities (Atomic Energy 2.0. 2020a; IAEA 2017). However, despite the wide range of instruments of influence at the international level, the IAEA, nevertheless, was unable to resolve the crisis situations associated with the nuclear programs of Iran and partly in other countries on its own. At the same time, it should be understood that the nuclear issues under similar scenarios go far beyond international cooperation in the exploitation of nuclear energy for peaceful purposes, passing into the political plane. Another aspect of the activities of international organizations in the field of nuclear energy, in particular the IAEA, which is criticized, concerns the issue of insufficient control over nuclear power plants (NPPs) (Ioyrysh and Fatyanov 2014).

Taking into account the fact that accidents at civilian nuclear infrastructure facilities do not occur frequently, at the same time, the accident at the Japanese NPP Fukushima has renewed the discussion on the introduction of stricter control by the IAEA over safety processes at nuclear power facilities. At the same time, opposing this opinion, it should be noted that it is impossible to infringe on the sovereign right of states to carry out full-fledged activities in the field of nuclear energy. In addition, the redistribution of control functions and powers in this area may lead to the replacement of the real responsibility of authorized state bodies with the bodies of international organizations, whose responsibility may be vague (Ioyrysh and Fatyanov 2014).

According to a 2011 BBC poll, there was little support for the construction of new nuclear reactors in the world at the time. The global research agency GlobeScan, commissioned by BBC News, conducted a survey of 23,231 people in 23 countries from July to September 2011, months after the nuclear disaster at the Fukushima NPP (BBC 2019). It was noted that in 2011, in countries with existing nuclear programs, people were much more opposed to nuclear programs than in 2005, and only the UK and the USA were the exceptions to this trend. The majority of those surveyed at the time were of the opinion that improving energy efficiency and renewable energy sources could meet their needs (Black 2011).

In this context, the question of whether there is a connection between international private law and atomic law is of certain interest, given the fact that the latter, as a rule, is considered precisely in the public law plane, and civil legislation does not consider compensation of losses caused by natural disasters. Compensation for damage caused by a disaster, be it a human-made or natural disaster, is the task of a state concerned (Nuclear Energy Agency 2010). Thus, speaking of the extension of private international law to atomic legal relations, it is very important in this aspect to consider an example of court cases related to the accident at the Fukushima NPP in 2011 against the American corporation General Electric (GE).

Considering the background of this issue, it should be noted that initially in Japan more than 12 thousand people filed lawsuits against the state for the accident at the Fukushima NPP. The Fukushima Prefecture District Court has ruled that the Tokyo Electric Power Company (TEPCO) and the Japanese government are liable for damage caused by the 2011 tsunami disaster at the Fukushima NPP. The government and the NPP were awarded ¥500 million ($4.44 million; €3.77 million) to residents of Fukushima who sought damages for the loss of their livelihood (DW 2017).

According to Japanese law, all claims related to natural disasters must be brought against TEPCO, either in civil or administrative procedure. TEPCO has already paid part of the claim partly subsidized by the Japanese government. However, the plaintiffs,

in this case, filed a lawsuit in Boston, USA, where GE is headquartered, arguing that a US court should give them the opportunity to sue the US corporation. According to the plaintiffs, GE was negligent in the design and maintenance of the plant, as well as in the site selection, which had a "long history of very strong earthquakes and tsunamis." Meanwhile, in April 2019, the head federal judge in Massachusetts dismissed the claim on formal grounds, stating that the case should be brought in Japan since there is an appropriate remedy mechanism for such issues.

Subsequently, in April 2020, the US Court of Appeals for the First Circuit denied Japanese plaintiffs the right to seek compensation from General Electric for the Fukushima accident. Now the plaintiffs, in this case, will have to make a choice—either to try to challenge the decision of two courts in the US Supreme Court, which will take years and does not guarantee success, or to concentrate on legal proceedings in Japan (Harrison 2020; Hursh 2020).

This example recently, perhaps, best describes the relationship between atomic law and private international law in the context of the possibility of expanding the effect of the latter. In this case, there are all the necessary elements that characterize both types of legal relations: the issue of determining jurisdiction, a foreign element, and issues falling within the scope of international legal acts in the field of nuclear law. At the same time, it should be understood that today such an example is, perhaps, a single one, which is due to both geographical specifics (a seismically active zone) and technological ones of the accident itself that occurred at the NPP (according to plaintiffs, negligence in design). However, it should be noted that this issue can serve as an important precedent for private international law. At the same time, neither in the EU, nor in the CIS, the issue of the transition of atomic law elements to the private law plane is currently not being considered—EU acts regulate in detail the sphere of atomic law, and the legislator initially laid the public-legal essence in its basis (Engstedt 2020; Stoiber et al. 2003). As for the CIS countries, to date, no private law disputes have been recorded directly in the field of nuclear law. At the same time, the example of Japan suggests that it would be premature to exclude such a possibility.

One way or another, it becomes obvious that the elements of international private law penetrate into the sphere of international nuclear regulation. In this regard, the question arises whether the existing judicial mechanisms are sufficient to protect the rights of individuals to a safe environment, enshrined in the constitutions of many countries, and provided for by international agreements, in particular the Stockholm Declaration of 1972, the Rio de Janeiro Declaration of 1992 and the recently adopted Global Pact for Environment.

To understand the basic principles of regulation of civil liability for nuclear damage, it is necessary to note the following generally recognized principles of such regulation, which underlie the Vienna Convention on Civil Liability for Nuclear Damage. Thus, the legal regime provided for in the Convention is based on the following general principles:

- exclusive liability of the operator of the nuclear installation concerned;
- "absolute" or "strict" liability, so that the injured party is not required to prove fault or negligence on the part of the operator;
- minimum amount of liability;
- obligation for the operator to cover liability through insurance or other financial security;
- limitation of liability in time;
- equal treatment of victims, irrespective of nationality, domicile, or residence, provided that damage is suffered within the geographical scope of the Convention;

- exclusive jurisdictional competence of the courts of the Contracting Party in whose territory the incident occurs or, in case of an incident outside the territories of Contracting Parties (in the course of transport of nuclear material), of the Contracting Party in whose territory the liable operator's installation is situated).
- recognition and enforcement of final judgments rendered by the competent court in all Contracting Parties (IAEA). In the context of the issue under consideration, the penultimate one is of particular importance.

Based on the example described previously, it is difficult to predict how the situation could turn out for international law in the field of nuclear energy if the American court in the case of the Japanese citizens against GE sided with the plaintiffs. In this case, first of all, one could speak of the appearance in international law of an appropriate precedent that could become a new source of law and significantly expand the range of subjects that can be held liable in the sphere of the legislation concerning liability for nuclear damage. It should be noted that although the possibility of citizens of one country appealing to contractors (or other entities involved in the construction or maintenance of civil nuclear facilities)—entities of another country is not provided for in the relevant international acts in the field of regulating liability for nuclear damage, but not directly prohibited. Considering the issue from this perspective, one could speak of the absence of appropriate mechanisms for private individuals to contact directly foreign contractors (designers, suppliers) in the plane of international nuclear legislation. At the same time, if we consider the question of the possibility of recovering compensation from suppliers of materials, equipment, etc., involved in the construction or maintenance of a nuclear power plant or related infrastructure, it seems that in the event of occurrence of precedents of this nature (namely, decisions in favor of the plaintiff) such precedents can have far-reaching implications as, in theory, any link in the supply chain, maintenance or operation could be sued.

Based on the context under consideration, it would be appropriate to refer directly to the text of the Vienna Convention on Civil Liability for Nuclear Damage of 1963, the Convention on Supplementary Compensation for Nuclear Damage of 1997, the Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency 1986—as the main international documents in the area under consideration.

The most important international document establishing a unified regime of civil liability for nuclear damage at the world level is the Convention on Civil Liability for Nuclear Damage, adopted in Vienna in 1963, supplemented by the 1997 Protocol. The aim of the above-mentioned Protocol, as explicitly stated in its preamble, is to amend the Vienna Convention on Civil Liability for Nuclear Damage to provide for a wider scope, higher levels of liability the operator of a nuclear installation and enhanced means of ensuring adequate and fair compensation. Pursuant to Article 18 of the Protocol, the Vienna Convention and the Amendment Protocol with respect to its parties are "understood and interpreted together as a single text, which may be referred to as the 1997 Vienna Convention on Civil Liability for Nuclear Damage."

In accordance with the Vienna Convention on Civil Liability for Nuclear Damage, the subject of liability is the operator of a nuclear installation; the carrier of nuclear material can also be recognized as an operator by the legislation of the state. As can be noted, the range of subjects under this convention is exhaustive.

Another international legal document regulating relations in this area is the Convention on Supplementary Compensation for Nuclear Damage. It was opened for signature in 1997 at the forty-first session of the IAEA General Conference and entered into force until almost 20 years later (April 15, 2015), when the necessary conditions were met. As

a general rule, this Convention determines that only the courts of the Contracting Party in which the nuclear incident occurred have jurisdiction over claims for compensation for nuclear damage resulting from a nuclear incident (Convention on Supplementary Compensation for Nuclear Damage).

In the 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the existence of compensatory mechanisms is considered only in relation to the death or personal injury of persons, damage to property or its loss or damage to the environment that occurred within its territory or another area under its jurisdiction or monitoring during the provision of the requested assistance (Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency). The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted in 1986 after the accident at the Chernobyl nuclear power plant, establishes an international framework for cooperation between States Parties and with the IAEA to facilitate operational assistance and support in the event of nuclear accidents or radiological emergencies. It requires States to notify the IAEA of the experts, equipment, and supplies available to them to provide assistance. If requested, each participating State decides whether it can provide the corresponding assistance, as well as its scope and terms (IAEA 1987).

As it can be noted, none of the considered mechanisms presupposes the possibility of individuals contacting directly foreign suppliers (developers) of equipment in order to recover compensation or bring them to justice. At the same time, the question of the need for such mechanisms remains open.

Based on the examples of world human-made disasters related to nuclear energy, it is natural for a person to consider the latter with caution, and if there is any alternative to such energy, then, without a doubt, the choice will be in favor of alternative sources. The opinion that nuclear energy carries a potential danger is formed in people from an early age. At the same time, a complete rejection of nuclear energy in the modern world can do much more harm than potential benefit, not to mention that such a scenario seems completely utopian. It cannot be denied that for all modern states with the appropriate technology, the nuclear industry is an important part of the energy balance. The international community recognizes the growing importance of the need to decarbonize electricity production to protect the planet from the dangers of air pollution and climate change. At the same time, technologies for obtaining nuclear energy have been tested, are available, and can be applied in almost any state, which makes this type of energy an important tool in solving the problem of global warming and the consequences it causes. According to the OECD Nuclear Energy Agency, electricity production based on nuclear technologies is the most economical option to achieve the decarbonization goal of 50 g per 1 kWh (one of the goals stipulated by the Paris Agreement) (Nuclear Energy Agency 2019).

When considering emissions over the entire life cycle, nuclear power is considered one of the best sources of energy. The IPCC (Intergovernmental Panel on Climate Change) Special Report on 1.5 °C Global Warming concluded that limiting climate change would require almost immediate reductions in global greenhouse gas emissions. At the same time, this factor implies the transition to electricity. Meeting the higher demand for electricity through low-carbon production includes the use of nuclear power. Based on the 89 mitigation scenarios associated with such a transition, considered by the IPCC, by 2050 nuclear generation will increase on average by about 2.5 times (IAEA Bulletin 2017). Taking into account the fact that today, on a global scale, alternative sources are not able to meet electricity needs in full, in recent decades there has been an increasing interest in NPPs. Extending the operational life cycle of a power plant is more cost-effective than building a new one (Panfilova et al. 2020). Therefore, in many modern states with nuclear power (for

example, the USA, France), in cases where it is justified from an economic point of view, NPPs seek to renew their licenses. This, in turn, involves avoiding power outages and supporting countries' efforts to reduce carbon emissions (IAEA Bulletin 2017).

In 2016, nuclear reactors were operated in half of the EU member states: Belgium, Bulgaria, Czech Republic, Germany, Spain, France, Hungary, the Netherlands, Romania, Slovenia, Slovakia, Finland, Sweden, and the UK. The remaining 14 EU member states did not have nuclear facilities. The main use of nuclear energy is electricity generation, and in 2016 gross electricity generation from NPPs in the EU member states was 839.7 thousand Gigawatt-hours (GWh). In other words, NPPs produced about a quarter (25.8%) of the electricity generated in the EU in 2016.

France is currently the largest nuclear energy producer among the EU countries. It accounted for 48% of total EU production in 2016. It is followed by Germany (10%), Great Britain (8.5%), Sweden (7.5%) and Spain (7%). Together, these five Member States accounted for more than 80% of the total electricity generated by nuclear facilities in the EU (Eurostat 2018) (EU countries with nuclear power generation capacity—see Fig. 1).

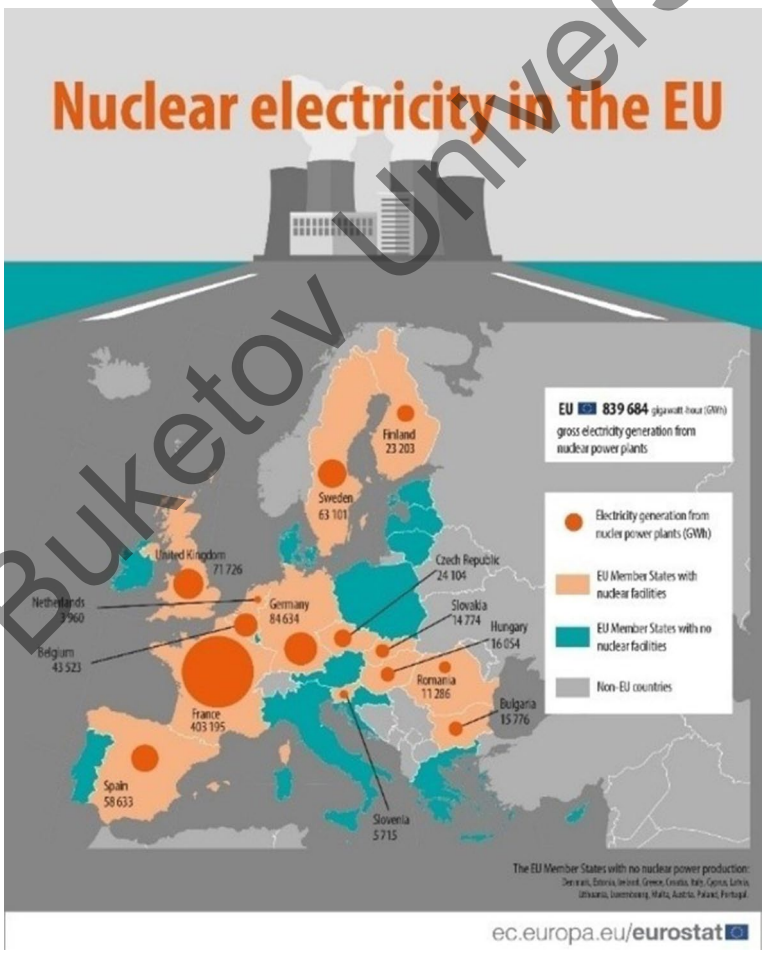

Fig. 1 EU countries with nuclear power. *Source*: Eurostat (2018)

It should be noted that over the past decade, the EU has recorded a decline in nuclear energy production, which is mainly associated with the policies of the member states regarding climate change. On a timescale over the past 30 years, two opposing trends can be distinguished with respect to the generation of electricity from nuclear power. From 1990 to 2004, the total amount of electricity generated by nuclear facilities in the EU increased by 27%, peaking at 1008.4 thousand GWh in 2004. However, between 2004 and 2016, total nuclear energy production in the EU decreased by 17% (Eurostat 2018).

From 1990 to 2016, most Member States operating nuclear facilities increased their nuclear power generation. This is especially the case in the Czech Republic (+91.5%), followed by France (+28.4%), Slovenia (+23.6%), Slovakia (+22.7%), Finland (+20.7%), Hungary (+16.9%), the Netherlands (+13.1%), Great Britain (+9.1%), Spain (+8.0%), and Bulgaria (+7.5%). In contrast, Lithuania recorded the most significant decline as it closed its nuclear facilities in 2009, ahead of Germany (−44.5%) and Sweden (−7.6%) (Eurostat, 2018).

In modern conditions, the largest share of electricity produced in France is generated precisely at NPPs, which provides the state with energy independence. The Law of the French Republic of July 13, 2005, "Directions of Energy Policy" refers to the use of nuclear energy as the main source of electricity in the country. At the same time, diversification of electricity production based on renewable sources is encouraged. The operating lifetime of one-third of French NPPs expired in 2020. Faced with the need to upgrade existing NPPs, France is preparing to commission new reactors that meet the criteria of economic competitiveness, environmental requirements, and increased safety. In April 2007, France began construction of the 3rd generation reactor in Flamanville, the commissioning of which was originally scheduled for 2018 (Embassy of France in Moscow 2021). In June 2019, it was announced that the launch of Unit 3 would not be possible before the end of 2022 (France 24 2019).

The issue of postponing the construction of six new nuclear reactors was put on the agenda due, inter alia, to pressure from neighboring Germany and local environmental organizations. At the same time, France will consider the possibility of switching to alternative energy sources. The final decision on this matter will be made after the commissioning of new reactors already under construction in Flamanville. Various advocacy groups have managed to impede the French initiative to revive nuclear energy. French nuclear energy policy has caused a negative response in Germany, which continues minimizing nuclear energy. At the same time, nuclear technology development in France has de facto challenged Germany in this matter (Mauger 2018; Perez et al. 2020).

There is no common vision in Europe concerning energy. At a time when alternative energy sources play an increasing role in Germany, France exploits much cheaper NPPs. In France, which is being criticized for nuclear energy use, the electricity cost is almost twice lower than in Germany (Atomic Energy 2.0. 2020b).

In Germany, the abandonment of nuclear energy is largely compensated by the production of electricity from fossil fuels and, to a lesser extent, by electricity import. The growing trend toward increased green energy production plays a significant role (Cherp et al. 2017).

Currently, German fossil fuel power plants produce 32% more electricity, gas—26% more than would be the case with nuclear power. At the same time, it should be noted that the operating costs of NPPs are relatively low, in contrast to coal power plants. Having abandoned nuclear power, Germany increased its wholesale prices for electricity by 3.9% (Atomic Energy 2.0. 2020a).

Nuclear energy is one of the most regulated areas in the EU energy sector. This is due to the attention of European states to nuclear energy even before the formation of the EU, the activity of Euratom, and other relevant international organizations. The basis of legal regulation in this area is the Euratom Agreement, which regulates the radiation protection of workers and the public, nuclear materials supply for nuclear power development, prevention of unauthorized nuclear materials use, and general aspects such as research and information spread (Plachkova 2019). In accordance with the Euratom Agreement, the European Commission received the status of a supranational regulatory body in this area. Based on the Euratom Agreement provisions, a significant number of various EU nuclear energy legal acts were developed and adopted. Among the main legal acts in this area, it is worth highlighting such documents as:

- the statutes of the Euratom Supply Agency dated November 6, 1958;
- the Euratom Supply Agency Rules determining the manner in which demand is to be balanced against the supply of ores, source materials, and special fissile materials;
- Council Directive 92/3/Euratom of February 3, 1992, on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community;
- Council Regulation (Euratom) 1493/93 of June 8, 1993, on shipments of radioactive substances between Member States (Plachkova 2019).

Concerning security issues in the field of nuclear energy, it is necessary to note the Communication of the European Commission dated March 26, 2009, on nuclear non-proliferation. As a soft law act and an internal EU legal act, this Communication is a document of a recommendatory nature for EU member states on the non-proliferation of nuclear materials and technologies. The Communication draws attention to the need to combat global warming that has led to structural changes in energy law and policy of almost any state. At the same time, the increasing role of nuclear energy is noted since no greenhouse gas emissions are carried out during its production. From this point of view, nuclear energy is environmentally friendly (Commission of the European Communities 2009).

At the same time, the European Commission notes that, despite all the advantages of nuclear energy, the risks of emergencies at nuclear power facilities and the use of nuclear energy technologies for purposes contrary to the international law principles are the main problems of this energy sector today (Abashidze et al. 2018).

In general, the existing EU nuclear energy policy and regulation have the following features:

- increased attention to energy issues, including energy sector legislative regulation;
- consistency and continuity of such regulation;
- building an efficiently functioning and competitive EU internal energy market;
- ensuring the reliability of energy supplies;
- the desire to reduce dependence on imports;
- increasing the share of renewable energy sources and improving energy efficiency;
- focus on combating climate change;
- consistency of external energy policy (Abashidze et al. 2018).

The EU's attention paid to nuclear energy issues is due to and inextricably linked to key moments in the history of the formation of the Union, which determines its strategic vectors. Primarily, it worth mentioning that fact that the European Atomic Energy

Community was created almost simultaneously with the signing of the Rome Agreements in 1957. Today, all branches of the nuclear power industry (including radiation protection, safeguarding nuclear materials, nuclear research, training activities, and information) have appropriate comprehensive legislative regulation (Anthony 2013; European Parliament 2020).

Considering nuclear energy legal regulation at the CIS interstate level, one should note, first of all, that not all countries of this international organization have nuclear facilities. Today, only Armenia and Belarus are among the CIS countries that have nuclear power plants. In Belarus, the first power unit was commissioned recently—in 2020 as a result of close technical cooperation with Russia in the energy sector (Euronews 2020).

The undoubted leader in the field of nuclear energy among CIS countries is Russia, claiming the role of an energy superpower, a concept first announced in 2006 against the backdrop of the G8 summit in St. Petersburg. The emergence of the concept defining Russia as an "energy superpower" took place on the eve of Russia's upcoming G8 presidency and, as is often noted, is closely related to the country's leadership's desire to identify a sector in which Russia's global economic leadership would not raise doubts (Kuteleva 2020; Tkachenko 2014). Based on this, Russia is steadily moving forward in implementing plans to expand the role of nuclear energy, including the development of new technologies. Russia actively promotes its nuclear energy technologies abroad, including with the help of foreign affairs agencies and offices of Rosatom (a Russian state corporation that unites more than 360 nuclear enterprises) in Russian embassies. This is supported by significant financial resources for the construction of nuclear infrastructure facilities in client countries, as well as the willingness to take part in construction, etc. (World Nuclear Association 2020).

For Russia, given its geographical scale and diversified economy, the nuclear industry plays an extremely important role. The strategic goals declared in recent years in the program documents on the economic development of Russia provide for priority attention to innovative, high-tech, and knowledge-intensive industries. Nuclear energy meets these requirements and is one of the most dynamically developing sectors of the Russian economy (Panteley 2017). Rosatom's foreign orders portfolio exceeded $ 130 billion by the end of 2019 (Rosatom). The implementation of large nuclear projects makes it possible to solve a whole range of important social and economic problems, to provide employment for the population, and to increase the filling of regional budgets. In addition, the implementation of such projects makes it possible to solve strategic problems related to the further increase in energy capacity and the competitiveness of Russian technologies and equipment on a global scale. The share of the Russian Federation in the world nuclear fuel market is 45%. Russia holds 50% each in the US and Canadian markets, 42% in Europe, 35% in South Korea, 30% in Latin America, and 10% each in China and Japan. To maintain its leading position, Russia is required to increase capacity and carry out market and technological transformations in the industry (Kozlov and Zakharov 2015).

Speaking of cooperation within the CIS, in the field of nuclear energy, the results of bilateral cooperation between Russia and Armenia are mainly related to the operation of the Metsamor NPP. On March 27, 2014, the Armenian government approved the proposal submitted by the Ministry of Energy and Natural Resources to extend the operational lifetime of the Metsamor NPP by 10 years. Work to extend the lifetime of the NPP is carried out at the expense of Russian credit funds. In 2015, an intergovernmental agreement was signed to provide Armenia with a state export credit worth $270 million and grant aid of $30 million (allocated in April 2015 by the order of the Russian government) to finance

work to extend the NPP's lifetime. The work on its modernization is carried out by the Rosatom (TASS 2017).

Today, fossil fuels prevail in the fuel and energy complex of Kazakhstan, however, the state seeks to diversify its energy balance, despite the presence of a significant amount of fossil fuels in the country. Despite the fact that Kazakhstan has significant reserves of uranium, and in 2014 the country was the leading producer of it in the world, however, the prospects for the development of nuclear power in the country have not been finally determined, and the feasibility is questioned (Ahmad et al. 2017). In addition to uranium ores, Kazakhstan possesses significant resources of fossil fuels (oil, natural gas, and coal), which, on the one hand, makes it expedient to use these resources for electricity production, but on the other hand, it can be considered as an obstacle in the diversification of electricity sources (Eshchanov et al. 2013). In 2015, about 90% of the total electricity generated in Kazakhstan was generated from fossil fuels, with coal and gas being the main natural resources used in electricity generation. The only significant renewable energy is hydropower, which accounts for about 10% of total electricity production. Mini-hydroelectric power plants, biomass, wind energy, and solar energy accounted for less than 1% of the country's total fuel and energy system (Ahmad et al. 2017).

At the same time, the only industrial NPP operating in the country was closed in 1999, and the issue of building a new one is under negotiation. If a decision is made on the need for its construction, the Russian corporation Rosatom may become a contractor (Panchenko 2019). At the same time, several research nuclear reactors are operating in the country today (Koch and Tynkkynen 2019). Despite the absence of operating industrial facilities in Kazakhstan, the Republic has a developed legal framework in the field of atomic energy use, represented, in particular, by the following acts:

- the Law of the Republic of Kazakhstan dated January 12, 2016, No. 442-V ZRK "On the Use of Atomic Energy";
- Government Resolution "On the approval of the technical regulations 'Nuclear and Radiation Safety of Nuclear Power Plants'";
- "On Approval of the Rules for Selecting the Location of Nuclear Installations and Disposal Facilities."

The latter, along with the atomic legislation of the Russian Federation, if necessary, can be used as the basis for a single supranational legal act in the field of nuclear energy (Lizikova 2017).

Considering Kazakhstan as an active member of the CIS, the issue of Kazakhstan's refusal of nuclear weapons and the conduct of nuclear tests deserves special attention. Since gaining independence in 1991, one of the country's main foreign policy vectors has been focused on nuclear issues. Along with Ukraine and Belarus, the country made history by alerting the international community of its decision to refuse its nuclear legacy. Later, the country adopted the non-proliferation regime, including a campaign to end nuclear tests (Maitre 2018).

Since the first nuclear weapon test in 1949, about 500 nuclear tests have taken place in the Kazakh city of Semey, including 200 aboveground ones. Half a million people were officially recognized as victims of nuclear tests, which prompted President Nazarbayev to mark this issue at the highest state level, comparing it to the tragedy on Hiroshima. This impact of nuclear weapons has formed a stable rejection of nuclear technologies among the population (Maitre 2018). As can be noted, the doubts of the Kazakhs about the use of nuclear technologies are not devoid of weighty grounds and have a deep background.

In this regard, Kazakhstan has repeatedly acted at the international level with initiatives related to the non-proliferation of nuclear weapons and aimed at the formation of a world free of nuclear weapons. To achieve these goals, the initiatives of the former President of the Republic N. Nazarbayev are aimed at adopting:

- the Nuclear-Weapons-Free World Declaration within the UN;
- the Atom initiative to prepare a petition to the heads of states and governments who have not yet signed the Treaty on the Non-Proliferation of Nuclear Weapons and the Comprehensive Nuclear-Test-Ban Treaty (UN News 2013).

Currently, Kazakhstan is seeking to use its experience in the uranium industry through technology transfer negotiations with its international partners, including the USA, Canada, China, and Russia, possibly in exchange for raw materials. To improve nuclear safety, Kazakhstan launched a program to safely handle high enriched uranium (HEU) on its territory and to minimize civil use of HEU technologies. Advances in this area include:

- conversion of the VVR-K nuclear research reactor to low enriched uranium (LEU) fuel;
- downblending of HEU from the Institute of Nuclear Physics in Almaty to LEU at the Ulba Metallurgical Plant;
- transfer for safe storage of spent fuel from the reactor in Mangistau (Mangyshlak Power Plant) (Oxford Analytica 2015).

By August 2015, high nuclear safety standards allowed Kazakhstan to reach an agreement with the IAEA to establish LEU bank. By the end of 2017, the construction of an LEU storage facility was completed in Kazakhstan, and in 2019, the first LEU batch arrived at the Ulba Metallurgical Plant (UN News 2019). LEU bank in Kazakhstan is part of a global effort to create guaranteed market-based supplies of nuclear fuel to countries in the event of a failure or disruption of existing supply mechanisms. In addition, Kazakhstan is a member of the Nuclear Suppliers Group, which seeks to contribute to the non-proliferation of nuclear weapons through the implementation of guidelines for nuclear products export (Oxford Analytica 2015).

The Framework Program for Cooperation between the CIS member states in the field of atomic energy use for the period up to 2020 “Atom-CIS cooperation” has been in effect since 2011. The latter is aimed at improving the national and interstate legal framework in this industrial sector. The Interstate Target Program “Reclamation of territories of states affected by uranium mining industries” has also been launched (Government of the Russian Federation 2017).

In October 2020, the 21st meeting of the Commission of the CIS Member States on the Use of Atomic Energy for Civilian Purposes was held in the format of a videoconference, during which the results of the implementation of the ATOM-CIS Cooperation program and the Interstate Target Program “Reclamation of territories of states affected by uranium mining industries” were discussed. During the conference, the experts of the international working groups presented draft documents determining the Commission’s further activities:

- Framework Program for Cooperation of the CIS Member States in the Field of Peaceful Uses of Atomic Energy for the Period up to 2030;

- Action Plan for the Implementation of the Framework Program for Cooperation between the CIS Member States in the field of atomic energy use for peaceful purposes for the period 2021–2025.

The documents were subsequently adopted at a meeting of the Council of CIS Heads of Governments (CIS Internet-Portal 2020; Government of the Russian Federation 2017).

During the meeting, a draft memorandum was approved on the establishment of safety regulatory bodies for atomic energy use in the CIS countries and organizations providing their scientific and technical support. It is planned that the activities of the new organization will be aimed at promoting nuclear and radiation safety in the CIS, improving the regulatory system and legislation, and strengthening ties between scientific and technical support organizations (Ministry of Energy of the Republic of Belarus 2020).

4 Discussion

As can be noted from the above, the position of the EU countries regarding the future of nuclear energy is ambiguous and far from consensus. In the near future, nuclear power may finally lose its link to the term "green technologies," which means for it the loss of significant subsidies and investments. Defending its position on nuclear energy preservation, France is opposing a bloc of "anti-nuclear" countries led by Germany, Austria, and Luxembourg. Under pressure from these countries in March 2019, the European Parliament excluded nuclear energy production from the list of "green technologies." At the same time, the final point on this issue has not been set, and France intends to continue to defend its interests in the EU. In this regard, French officials are of the opinion that nuclear power continues to be an important tool in the context of the fight against global warming. The French government intends in this regard to continue dialogue with its German opponents (Atomic Energy 2.0. 2020b).

Against this background, Russia consistently adheres to the opinion that the global goals of sustainable energy supply can be achieved only with the widespread use of nuclear energy. Although renewables are not entirely ignored, it is clear that they are destined to play a secondary role in the Russian energy sector. At the same time, the opinion that the existing nuclear energy technologies require modernization is not rejected (Liu and Shestak 2020). The current policy of Russia in the energy sector implies that the real embodiment of efficient and balanced energy supply will depend on the level of safety of nuclear reactors, the introduction of a closed nuclear fuel cycle, increasing the efficiency and useful use of the installed capacity of power reactors. To this end, a scientific and technological project "Breakthrough" is being implemented in Russia, which provides for the creation of a scientific and technological base for nuclear energy safety. It is assumed that the transition to a closed nuclear fuel cycle will significantly increase the economic efficiency of nuclear power (Sklyar 2019). The Russian government perceived with enthusiasm the news on the US bill on leadership in the nuclear power industry. The bill even found its reflection in the Decision of the State Duma Committee on energy from July 25, 2019 (State Duma Committee on Energy 2019).

Considering this issue in the context of achieving leadership in the nuclear industry, it should be noted that, based on the report of the US Nuclear Fuel Working Group, the country is on the verge of losing its ability to produce uranium for nuclear fuel production, which threatens national interests and national security. According to the US Department

of Energy, the US Strategy to Restore American Nuclear Energy Leadership is a strategic document that includes policy recommendations for the executive branch, Congress, and regulators that can take action to:

- enhance nuclear power positive characteristics;
- revitalize opportunities for uranium mining and processing;
- strengthen the technological superiority of the USA;
- stimulate US exports;
- provide support for national security.

The strategy includes the following recommendations:

- taking immediate and decisive action to strengthen uranium mining and processing facilities and restore the viability of the nuclear fuel cycle;
- leveraging the cutting-edge achievements of scientific and technological progress and directing additional investment in research and development in the field of civil nuclear energy to consolidate technical advances and strengthen American leadership in civil nuclear technologies;
- implementing measures to ensure sustainable growth of the nuclear power sector, in which uranium miners, nuclear fuel suppliers, and reactor manufacturers can sell their goods and services;
- using a nationwide approach to supporting US nuclear power, civil nuclear technology export in competition with state-owned enterprises.

The strategy notes that the credibility of the US nuclear non-proliferation regime depends on the viability of civil nuclear energy, as well as on leading global standards embodied in the US nuclear safety regulatory frameworks (US Energy Department 2020).

The issue of developing unified standards in the field of nuclear waste disposal requires legislative regulation at the supranational level. In countries with nuclear power plants, spent nuclear fuel is stored at or outside reactor sites (Mikhailova 2019). Lack of standards for the management of spent fuel leads to inadequate storage and can pose a potential and immediate hazard to people and the environment. Countries, as a rule, do not show initiatives for the disposal of nuclear waste from other countries on their territory, therefore, in the future, countries with nuclear power will most likely have to place such waste on their territory. This, in turn, presupposes the existence of permanent schemes for its disposal. At the same time, the support of the local population should become a key factor in determining such schemes. Best practices in this regard are from Finland and Sweden, which are already building the world's first disposal facilities for spent nuclear fuel (IAEA Bulletin 2017; Mikhailova 2019). To reinforce the case for nuclear power and ensure broad public support, the participation of all stakeholders at every stage of planning and throughout the life cycle of nuclear infrastructure is critical (IAEA Bulletin 2017).

At the same time, the global nature of nuclear energy, both in terms of its advantages and problems, requires overcoming the fragmentation of the international regime of liability for nuclear damage. Today, in this area of legal regulation there are three above-mentioned conventions—the Paris Convention on Third Party Liability in the Field of Nuclear Energy, the Vienna Convention on Civil Liability for Nuclear Damage, and the Convention on Supplementary Compensation for Nuclear Damage. They are united by the general principle of the need for financial compensation for nuclear damage, but they differ significantly in the amounts, forms, and mechanisms for providing compensation. This factor is,

in a sense, an obstacle to the development of multilateral cooperation in nuclear energy. It is possible that the solution to the problem would be the adoption of an additional supranational act combining the advantages of all three conventions and eliminating duplication (Lysenko 2017).

In the international legal context, a lot of efforts will have to be focused on such areas as cooperation in industries adjacent to nuclear, primarily within the framework of international security law. The following issues are particularly relevant:

- legal regulation of radiological terrorism prevention;
- a comprehensive settlement of the nuclear problem on the Korean Peninsula;
- development of legal regimes for nuclear-free zones;
- multilateral negotiations to ban the production of fissile materials for nuclear weapons (Lysenko 2017).

5 Conclusions

The current study gives grounds to speak of the existence of unambiguous prerequisites for expanding the scope of international legal regulation in the field of nuclear energy to the sphere of international private law relations, as evidenced, in particular, by the case initiated by the Japanese plaintiffs in private law against the American company General Electric. Despite the growing tendency in society to perceive nuclear energy as potentially dangerous, nevertheless, today there is no compelling reason to talk about a reduction in its role in the world energy market. At the same time, it is permissible to assume that in the event that a positive decision is made on a similar claim, such a decision may become a landmark legal precedent, significantly expanding the list of defendants in cases of compensation for atomic damage, and, accordingly, requiring additional legal regulation.

Summarizing this study, it can be noted that the CIS countries that have atomic energy capacities, although committed to the goals of decarbonization and reducing the anthropogenic impact on the environment, gravitate toward the advancement of nuclear technologies, as evidenced by the construction of new nuclear facilities in Belarus. For Russia, the development of civil nuclear energy has not only economic significance but also strategic one in political terms, as the country is aimed at achieving recognition as an "energy superpower." The interaction of the CIS countries in the nuclear sector, where the Russian Federation dominates, is developing at a consultative and advisory level. The expansion of the legal regulation in this area today can take place only in the case of construction of new capacities or the development and application of new technologies in the nuclear sector.

Speaking about the legislative regulation of the EU countries in the field of nuclear energy, it can be noted that today it is quite complete and detailed. In general, it can be assumed that the future international legislative regulation of the EU countries will be based mainly on soft law acts, allowing the participating countries to pursue independent internal policies in this regard. At the same time, current trends indicate that for the CIS countries, in particular Russia, Belarus, legal regulation in the nuclear power industry in the near future will have a two-sided focus, relating mainly to issues of an operational, investment, and technical nature. Today, it is impossible to assert that there are any prerequisites for the adoption of nuclear energy supranational documents that may apply to the CIS. At the same time, national legal regulation in the nuclear industry will remain dominant. Separately, the study draws attention to the emergence of international private

law elements in the regulation of nuclear energy, which are a kind of precedent that can be taken into account by the judicial authorities when considering disputes in both the EU and the CIS.

Future studies of nuclear industry legal regulation might be devoted to the analysis of foreign political interaction with regard to nuclear energy between the EU member states that are opponents and supporters of nuclear energy production.

Funding Aigul Nukusheva was financially supported as a holder of the title and state grant "The best teacher of the university—2020."

Data availability Data will be available on request.

Declarations

Conflict of interest The authors declare that they have no conflict of interests.

References

Abashidze, A. K., Inshakova, A. O., Solntsev, A. M., Alisievich, E. S., Baltutite, I. V., Barinov, N. A., et al. (2018). European Union law. Retrieved from January 13, 2021. https://studme.org/234298/pravo/pravo_evropeyskogo_soyuza_.

Ahmad, S., Nadeem, A., Akhanova, G., Houghton, T., & Muhammad-Sukki, F. (2017). Multi-criteria evaluation of renewable and nuclear resources for electricity generation in Kazakhstan. *Energy, 141*, 1880–1891. https://doi.org/10.1016/j.energy.2017.11.102

Al-Masri, A. N., & Al-Assaf, Y. (2020). *Sustainable Development and Social Responsibility—Volume 2*. AUEIRC'18—Dubai, UAE 2018. https://doi.org/10.1007/978-3-030-32902-0

Anisina, K. T., Davydova, M. A., Kostikova, E. G., Migacheva, E. V., Tsindeliani, I. A., Proshunin, M. M., Lyutova, O. I., & Pavlova, E. Y. (2021). Policy note: transformation of the legal mechanism of taxation under the influence of digitalization: Russian case study. *Intertax, 49*(5), 435–446.

Anthony, I. (2013). *The role of the European Union in Strengthening nuclear security*. EU Non-Proliferation Consortium.

Atomic Energy 2.0. (2020a). Europe assessed the consequences of abandoning nuclear energy. Retrieved from January 13, 2021. https://www.atomic-energy.ru/news/2020/04/14/102906

Atomic Energy 2.0. (2020b). Will France give up nuclear energy? Retrieved from January 13, 2021. https://www.atomic-energy.ru/SMI/2020/01/27/100923.

BBC (2019). Profile: IAEA, the nuclear watchdog. Retrieved from January 13, 2021. https://www.bbc.com/news/world-europe-17117069

Black, R. (2011). *Nuclear power 'gets little public support worldwide'*. Retrieved from January 13, 2021. https://www.bbc.com/news/science-environment-15864806.

Cherp, A., Vinichenko, V., Jewell, J., Suzuki, M., & Antal, M. (2017). Comparing electricity transitions: A historical analysis of nuclear, wind and solar power in Germany and Japan. *Energy Policy, 101*, 612–628. https://doi.org/10.1016/j.enpol.2016.10.044

CIS Internet-Portal (2020). *LIST OF DOCUMENTS adopted at the meeting of the Council of Heads of Government of the Commonwealth of Independent States on November 6, 2020.* Retrieved from January 13, 2021. https://e-cis.info/page/3758/89205/.

Commission of the European Communities (2009). *Communication from the Commission to the Council and the European Parliament.* Brussels, 26.3.2009 COM. Retrieved from January 13, 2021. https://www.europarl.europa.eu/meetdocs/2009_2014/documents/com/com_com(2009)0143_/com_com(2009)0143_en.pdf.

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Retrieved from March 11, 2021. https://treaties.un.org/Pages/showDetails.aspx?objid=08000002800cf807.

Convention on Supplementary Compensation for Nuclear Damage. Retrieved from March 11, 2021. https://www.congress.gov/treaty-document/107th-congress/21/document-text.

DW (2017). *Fukushima court orders Japanese government and TEPCO to pay damages over nuclear disaster.* Retrieved from January 13, 2021 https://www.dw.com/en/fukushima-court-orders-japanese-government-and-tepco-to-pay-damages-over-nuclear-disaster/a-40883824.
Embassy of France in Moscow (2021). *Nuclear Affairs Division.* Retrieved from January 13, 2021. https://ru.ambafrance.org/Otdel-po-yadernym-voprosam.
Embling, D. (2018). *The EU's nuclear power dilemma.* Retrieved from January 13, 2021. https://www.euronews.com/2018/04/11/the-eu-s-nuclear-power-dilemma.
Engstedt, R. (2020). *Handbook on European Nuclear Law: Competences of the Euratom Community under the Euratom Treaty*. Kluwer Law International BV.
Eshchanov, B. R., Stultjes, M. G. P., Eshchanov, R. A., & Salaev, S. K. (2013). Prospects of renewable energy penetration in Uzbekistan—Perception of the Khorezmian people. *Renewable and Sustainable Energy Reviews, 21*, 789–797. https://doi.org/10.1016/j.rser.2013.01.023
Euronews (2020). *Belarus' first nuclear power plant launches despite Baltic unease.* Retrieved from January 13, 2021. https://www.euronews.com/2020/11/05/belarus-first-nuclear-power-plant-launches-despite-baltic-unease.
European Parliament (2020). Fact Sheets on the European Union—Nuclear Energy, from https://www.europarl.europa.eu/factsheets/en/sheet/62/nuclear-energy.
Eurostat (2018). *How much nuclear power does the EU generate?* Retrieved from January 13, 2021. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180504-1.
France 24 (2019). *Snag-hit new French nuclear power station delayed by further 3 years*. Retrieved from January 13, 2021. https://www.france24.com/en/20190726-snag-hit-new-french-nuclear-power-station-delayed-further-3-years.
Gardiner, N. (2007). The decline and fall of the United Nations: Why the UN has failed and how it needs to be reformed. *Macalester International, 19*(1), 9.
Government of the Russian Federation (2017). *Order of the Government of the Russian Federation of April 20, 2017 No. 752-r "On approval of the draft Agreement of the CIS states on the convergence of approaches in the field of peaceful uses of atomic energy"*. Retrieved from January 13, 2021 http://government.ru/docs/27395/.
Greer, S., Gerards, J., & Slowe, R. (2018). Human rights in the Council of Europe and the European Union: achievements, trends and challenges (Vol. 29). Cambridge University Press. https://legalresearch.blogs.bris.ac.uk/2018/06/human-rights-in-the-council-of-europe-and-the-european-union-achievements-trends-and-challenges/.
Harrison, T. F. (2020). *First Circuit Clears GE on Fukushima Nuclear Disaster.* Retrieved from January 13, 2021. https://www.courthousenews.com/first-circuit-clears-ge-on-fukushima-nuclear-disaster/.
Hursh, A. (2020). F*ederal appeals court dismisses case against GE over Fukushima nuclear disaster.* Retrieved from January 13, 2021. https://www.jurist.org/news/2020/04/federal-appeals-court-dismisses-case-against-ge-over-fukushima-nuclear-disaster/.
IAEA (1987). Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, from https://www.iaea.org/topics/nuclear-safety-conventions/convention-assistance-case-nuclear-accident-or-radiological-emergency#:~:text=The%20Convention%20on%20Assistance%20in,in%20the%20event%20of%20nuclear.
IAEA (2017). *Safety Assessment for Facilities and Activities: General Safety Requirements.* International Atomic Energy Agency. Retrieved from January 13, 2021. https://www-pub.iaea.org/MTCD/publications/PDF/Pub1714web-7976998.pdf.
IAEA Bulletin (2017). *Nuclear power for a clean-energy future.* Retrieved from January 13, 2021. https://www.iaea.org/sites/default/files/bull584-nov2017corr.pdf.
IAEA. Vienna Convention on Civil Liability for Nuclear Damage. Retrieved from March 11, 2021. https://www.iaea.org/topics/nuclear-liability-conventions/vienna-convention-on-civil-liability-for-nuclear-damage.
Ioyrysh, A. I., & Fatyanov, A. A. (2014). International law and atomic energy. *Space and Time, 3*(17), 231–240.
Katsuba, S., Shestak, V., Kvasnikova, T., & Bokov, Y. (2021). Liability for violation of environmental legislation in the EU. *European Energy and Environmental Law Review, 30*, 9–19.
Kawashima, S. (2016). *EURATOM between European Nuclear Integration and World Nuclear Order, 1955–1958 Integration, Independence and Proliferation (No. 16–17).* National Graduate Institute for Policy Studies. Retrieved from January 13, 2021. https://ideas.repec.org/p/ngi/dpaper/16-17.html.
Koch, N., & Tynkkynen, V. P. (2019). The geopolitics of renewables in Kazakhstan and Russia. *Geopolitics, 1*, 1–20. https://doi.org/10.1080/14650045.2019.1583214

Kozlov, V. V., & Zakharov, A. K. (2015). Innovative development of the Russian electric power industry and its role in ensuring the country's energy security (on the example of the development of nuclear energy). *Innovation and Investment, 1*, 2–6.

Kuteleva, A. (2020). Discursive politics of energy in EU–Russia relations: Russia as an "energy superpower" and a "raw-material appendage." *Problems of Post-Communism, 67*(1), 78–92. https://doi.org/10.1080/10758216.2018.1520601

Liu, Z., & Shestak, V. (2020). Issues of crowdsourcing and mobile app development through the intellectual property protection of third parties. *Peer-to-Peer Networking and Applications*, 1–8.

Lizikova, M. S. (2017). Legal analysis of the atomic legislation of the republic of Kazakhstan. *Scientific Developments: Eurasian Region 2017* (pp. 113–118). Moscow: Infinity Publishing House.

Lysenko, M. N. (2017). Is the international nuclear law a separate branch of international law? *Moscow Journal of International Law, 4*, 11–20. https://doi.org/10.24833/0869-0049-2016-4-11-20

Maitre, E. (2018). *Kazakhstan's nuclear policy: an efficient niche diplomacy? Note no. 10/2018.* Retrieved from January 13, 2021 https://www.frstrategie.org/en/publications/notes/kazakhstans-nuclear-policy-efficient-niche-diplomacy-2018.

Mauger, R. (2018). Forced nuclear energy reactors shutdown in France: The energy transition act's mechanisms. *The Journal of World Energy Law & Business, 11*(3), 270–281. https://doi.org/10.1093/jwelb/jwy011

Mikhailova, N. (2019). *Developing the first ever facility for the safe disposal of spent fuel.* Retrieved from January 13, 2021. https://www.iaea.org/newscenter/news/developing-the-first-ever-facility-for-the-safe-disposal-of-spent-fuel.

Ministry of Energy of the Republic of Belarus (2020). *A meeting of the Commission of the CIS Member States on the Peaceful Use of Atomic Energy was held.* Retrieved from January 13, 2021 https://minenergo.gov.by/sostojalos-zasedanie-komissii-gosudarstv-uchastnikov-sng-po-ispolzovaniju-atomnoj-jenergii-v-mirnyh-celjah/.

Nuclear Energy Agency (2010). *International Nuclear Law: History, Evolution and Outlook.* Retrieved from January 13, 2021 https://www.oecd-nea.org/law/isnl/10th/isnl-10th-anniversary.pdf.

Nuclear Energy Agency (2019). *The costs of decarbonisation: System costs with high shares of nuclear and renewables*. Retrieved from January 13, 2021 https://www.oecd-nea.org/jcms/pl_15000.

Office of Nuclear Energy (2020). US. Hosted IAEA 64th General Conference Side Event: U.S. Reactor Technologies Flexible Energy Security for Real-World Challenges the Time is Now. Retrieved from January 13, 2021 https://www.energy.gov/ne/nuclear-reactor-technologies/international-nuclear-energy-policy-and-cooperation.

Oxford Analytica (2015). Kazakhstan's example in promoting nuclear non-proliferation. Retrieved from January 13, 2021 https://www.oxan.com/media/1960/kazakhstan-nuclear-non-proliferation.pdf.

Panchenko, T. (2019). NPP in Kazakhstan: was, no, will it be? Retrieved from January 13, 2021. https://forbes.kz/process/energetics/aes_v_kazahstane_byila_net_budet/.

Panfilova, E., Dzenzeliuk, N., Domnina, O., Morgunova, N., & Zatsarinnaya, E. (2020). The impact of cost allocation on key decisions of supply chain participants. *International Journal of Supply Chain Management, 9*(1), 552–558.

Panteley, D. S. (2017). Features of international cooperation in the field of nuclear energy at the present stage. *WORLD (Modernization. Innovation. Development.), 8*(3.31), 368–375. https://doi.org/10.18184/2079-4665.2017.8.3.368-375

Perez, S., Den Auwer, C., Pourcher, T., Russo, S., Drouot, C., Beccia, M. R., et al. (2020). Understanding public perceptions of nuclear energy in France. *Research Square*. https://doi.org/10.21203/rs.3.rs-107417/v1

Plachkova, S. G. (2019). *Energy. History, present and future. Book 5. Electricity and environmental protection. Energy functioning in the modern world.* Retrieved from January 13, 2021. http://energetika.in.ua/ru/books/book-5.

Pobedinsky, V., & Shestak, V. (2020). Improving Environmental Legislation in Central Asia. *Environmental Policy and Law*, (Preprint), 1–11.

Roehrlich, E. (2016). The Cold War, the developing world, and the creation of the International Atomic Energy Agency (IAEA), 1953–1957. *Cold War History, 16*(2), 195–212. https://doi.org/10.1080/14682745.2015.1129607

Rosatom. History of the nuclear industry in Russia, from https://rosatom.ru/about-nuclear-industry/history/.

Sattler, T., Spilker, G., & Bernauer, T. (2014). Does WTO dispute settlement enforce or inform? *British Journal of Political Science*, *44*, 877–902.

Sklyar, G. (2019). *Improving legislative regulation - in the nuclear power industry—Is the most important component of the "technological breakthrough.* Retrieved from January 13, 2021. https://www.eprussia.ru/epr/365/7591299.htm.

State Duma Committee on Energy (2019). *Recommendations of the "round table" of the State Duma Committee on Energy on the topic "Legislative regulation of new generation nuclear energy technologies".* Retrieved from January 13, 2021. http://www.komitet2-13.km.duma.gov.ru/Rabota/Rekomendacii-po-itogam-meropriyatij/item/19547390/.

Stoiber, C., Baer, A., Pelzer, N., & Tonhauser, W. (2003). *Handbook on Nuclear Law.* IAEA. Retrieved from January 13, 2021. https://www-pub.iaea.org/mtcd/publications/PDF/Pub1160_web.pdf.

TASS (2017). *Russian–Armenian relations. Dossier.* Retrieved from January 13, 2021. https://tass.ru/info/803765

Tkachenko, S. L. (2014). The concept of an energy superpower and relations between the Russian Federation and the European Union in the field of energy. *Quality Economics, 8*, 84–94.

UN News (2013). Belarus, Kazakhstan and Ukraine see only positive in renouncing nuclear weapons. Retrieved from January 13, 2021. https://news.un.org/ru/audio/2013/10/1019991.

UN News (2019). IAEA confirms Iran resumes uranium enrichment at Fordow. Retrieved from January 13, 2021. https://news.un.org/ru/story/2019/11/1366881.

US Energy Department (2020). *Strategy to Restore American Nuclear Energy Leadership.* Retrieved from January 13, 2021. https://www.energy.gov/strategy-restore-american-nuclear-energy-leadership.

Vienna Convention on Civil Liability for Nuclear Damage. Retrieved from March 11, 2021. https://www.oecd-nea.org/jcms/pl_29283/vienna-convention-on-civil-liability-for-nuclear-damage-vienna-convention.

World Nuclear Association (2020). *Nuclear Power in Russia.* Retrieved from January 13, 2021. https://www.world-nuclear.org/information-library/country-profiles/countries-o-s/russia-nuclear-power.aspx.