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Overview

Trends in Nuclear Energy Development and Armenia's Nuclear Policy



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Introduction

At the 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28) in Dubai, 25 countries, including Armenia, signed the Declaration to Triple Nuclear Energy Capacity by 2050.[1] At the Nuclear Energy Summit held in Paris on March 10, 2026, world leaders emphasized the central role of nuclear energy in providing "clean, reliable, affordable and safe energy in the context of growing electricity demand and geopolitical tensions"[2]. Armenian Prime Minister Nikol Pashinyan participated in the conference and joined the objectives for the development of nuclear energy. Thus, the reassessment of domestic energy-sector strategies has strengthened the position of nuclear energy in the global energy mix.

Nuclear energy is considered climate-friendly in terms of carbon emissions. At the same time, the specific characteristics of nuclear energy in relation to other climate targets are not taken into account, particularly its impact on water resources and its alignment with the objectives and tasks of climate adaptation and mitigation programmes incorporated into national NDCs and strategies. Nuclear energy should be considered as a separate category within the energy sector and assessed in relation to climate policy according to specific targets.

Given the specific nature of nuclear energy, decisions have a direct political, economic and social impact on all countries, regardless of whether or not a particular country has nuclear energy facilities or facilities serving other purposes. It is extremely important that the national priorities of each individual country comply with the fundamental principle of **"SAFETY FIRST"**[3].

Nuclear Safety

The main guarantor of nuclear safety is the International Atomic Energy Agency (IAEA), which assesses the safety level of nuclear facilities, including in the context of threats posed by international terrorist acts. Armenia cooperates with the IAEA and publishes the results of inspections of the Armenian Nuclear Power Plant (ANPP).

Following an IAEA proposal, the TECDOC-640 document was adopted, under which all measures to improve the safety of ANPP Unit 2 in operation were implemented.

However, the functions of the IAEA are technical and advisory in nature and are based on international treaties and agreements between member states. An example is the IAEA's concern regarding the Zaporizhzhia Nuclear Power Plant[4], where the Agency merely called on the parties to the conflict to refrain from any actions that could jeopardize basic safety. The IAEA is not vested with powers to enforce its decisions.

IAEA member states do not guarantee safety or protection against terrorism—the responsibility for nuclear safety lies entirely with each individual state, rather than with the Agency[5]. In the current global political situation, the risk of terrorist attacks is also high for the ANPP.

International Agreements and National Legislation in the Nuclear Energy Sector

As a full member of the IAEA since 1993, Armenia is committed to applying international safety standards within the framework of its cooperation. For example, Armenia has ratified the following **international agreements** in the field of nuclear energy: the **Convention on Nuclear Safety**[6], the **Convention on Early Notification of a Nuclear Accident**[7], and the **Convention on the Physical Protection of Nuclear Material**[8].

Within the framework of national legislation, nuclear energy is regulated by a number of laws, government decisions and subordinate legal acts.

1. **The Law "On Safe Use of Nuclear Energy"**[9] regulates nuclear and radiation safety, supervision, and the protection of people and the environment when working with sources of ionizing radiation; establishes safety standards, licensing procedures and national emergency protection plans.
2. The **Law "On Licensing"** applies to the licensing of nuclear activities[10].
3. The **Law "On Environmental Impact Assessment and Expertise"**[11] applies at the stages of designing and operating nuclear facilities.
4. The **Law "On Civil Defence"**[12] concerns responses to nuclear accidents.

Government decisions and subordinate legal acts regulate nuclear and radiation safety standards and rules, as well as establish rules for the operation of nuclear power plants, including radioactive waste management and emergency planning.

The principal legal act aimed at protecting the population from nuclear or radiation accidents is RA Government Decision No. 2328-N of December 22, 2018, "On Approval of the National Plan for the Protection of the Population in the Event of Nuclear and/or Radiation Accidents at the Armenian Nuclear Power Plant (External ANPP Emergency Response Plan)"[13].

This decision establishes general criteria for protective measures used to reduce the risk of stochastic effects in radiation-related emergency situations, dosimetric quantities used in radiation-related emergency situations, general criteria for acute radiation doses, and other requirements.

Of particular importance is the fact that amendments are made to the Law "On the Safe Use of Nuclear Energy for Peaceful Purposes" when necessary. The latest amendment was introduced by Law HO-367-N of October 24, 2024[14].

Another important document is the **Comprehensive and Enhanced Partnership Agreement between the Republic of Armenia, the European Union and the European Atomic Energy Community and their Member States (CEPA)**, which was ratified by Armenia in 2021. Armenia undertook to carry out large-scale reforms in the energy sector, including the nuclear energy sector, with the aim of bringing the legal framework of the Republic of Armenia closer to that of the European Union.

With regard to the ANPP, the Agreement provides for the closure and safe decommissioning of the operating ANPP unit, as well as the adoption of a roadmap or action plan for this purpose, taking into account the need to replace it with new capacities in order to ensure the energy security and sustainable development of the Republic of Armenia.

For the implementation of the CEPA provisions, a roadmap was adopted by RA Prime Minister's Decision No. 666-L of June 1, 2019, and by the Prime Minister's Decision of January 9, 2026, which, in accordance with Decision No. 11-L, specifies implementation deadlines and responsible authorities.

Decision No. 666-L (Annex 2, section "COOPERATION IN THE FIELD OF NUCLEAR SAFETY") provides for the following measures:

Point 90. Implementation of amendments and additions to RA Government decisions concerning the inspection and control of shipments of radioactive waste and spent nuclear fuel by 2025.

Point 90 has not been implemented. As Point "81", with a deadline of the fourth quarter of 2028, it was included in the new roadmap approved by the RA Prime Minister's Decision of January 9, 2026.

Point 91. Introduction of new legislative and subordinate legal acts concerning the establishment of a nuclear safety legal framework for nuclear facilities, or amendments to existing regulatory acts, by 2024.

Point 92. By 2024, modernization of the policy, laws and legal acts governing the safe management of radioactive waste and spent nuclear fuel generated in the Republic of Armenia, in accordance with the obligations undertaken under international treaties on the safe use of nuclear energy, Council Directive 2011/70/Euratom of July 19, 2011, and IAEA safety standards.

Point 93. Implementation of amendments and additions to RA Government decisions concerning health protection requirements related to radioactive substances in drinking water by 2025.

Point 94. By 2025, implementation of amendments and additions to RA Government decisions concerning basic safety standards for protection against hazards arising from ionizing radiation.

Points 91, 92 and 93 have not yet been implemented and have been transferred to the new action plan approved by the decision of the Prime Minister of the Republic of Armenia of January 9, 2026, as Point 83, with a deadline of the fourth quarter of 2028.

Point 94 has been transferred as Point "85" to the new action plan approved by the decision of the Prime Minister of the Republic of Armenia of January 9, 2026, with a deadline of the second quarter of 2028.

Point 95. Ensuring compliance with the provisions of international treaties ratified by the Republic of Armenia after the adoption of the RA Law "On the Peaceful Use of Nuclear Energy" (the amendment to the Convention on the Physical Protection of Nuclear Material and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management), taking into account IAEA recommendations, harmonizing the law with EU directives, and Article 42 of CEPA.

In 1999, the RA Law "On the Safe Use of Nuclear Energy for Peaceful Purposes" was adopted[15]. Amendments and additions to the law, as obligations under CEPA, have been transferred to the new roadmap approved by the RA Government decision of January 9, 2026, with a deadline of the second quarter of 2028.

The Strategy states: “If the relevant studies confirm the safe operation of the second unit of the nuclear power plant after 2026, the Government intends to operate it at least until 2036,” and “Only with a nuclear power plant in the system is it possible to achieve the lowest level of greenhouse gas emissions compared with the other scenarios, which is consistent with the implementation of the Government’s long-term objectives for low-greenhouse-gas-emission development.” The Strategy particularly emphasizes that the level of nuclear safety will also be increased, including in the management and control of radioactive waste and spent nuclear fuel.

The communities with a population of 105,000 people are located within the 5–10 km impact zone of the ANPP. Yerevan, with a population of 1,143,000, is located 28 km from the ANPP.

Armenian Nuclear Power Plant

Nuclear energy in Armenia is primarily concentrated in the **Armenian Nuclear Power Plant (ANPP)**, which consists of two power units with VVER-440 reactors (V-270 model). The first ANPP unit was commissioned in 1976, and the second in 1980. The nominal capacity of each unit is 440 MW, with a design service life of 30 years.

Following the devastating Spitak earthquake, Units 1 and 2 were shut down in 1989 by decision of the Council of Ministers of the USSR. The subsequent dissolution of the USSR, the blockade of Armenia and the energy crisis of the early 1990s created a serious threat to the country’s security. In response to the situation, a decision was made to resume operation of the ANPP.

The restart of the plant required special safety measures and was carried out in the following areas: 1) assessment of the seismic conditions at the site; 2) assessment of the reactor core, particularly the fourth layer; and 3) availability of diagnostic systems for detecting and assessing leaks. After completion of all work in these areas, ANPP Unit 2, a JWRF-440-type reactor, was recommissioned on November 5, 1995. Its design capacity is 407.5 MW, and its design operating life is 30 years.

Responsibility for the safety of the ANPP rests with the Government of Armenia, which owns 100% of the plant’s shares, and with the enterprise itself, CJSC “Armenian Nuclear Power Plant”.

An independent advisory body, the Nuclear Safety Council, was established under the President of the Republic of Armenia and is currently operating. It consists of 12 specialists from 8 countries. The main objective of the Council is to assess the safety level and provide recommendations to the Armenian side, including relevant foreign organizations, regarding the safety of the ANPP.[16],[17]

Role of the ANPP in the Energy Sector of the Republic of Armenia

Armenia’s electricity system has been oriented toward nuclear energy, and until recently its development and stability were pursued in this direction, with the nuclear power plant playing a leading role. It is commonly assumed that the ANPP accounts for around 40% of Armenia’s total electricity generation. In reality, this figure is somewhat lower. In 2023–2024, out of 9,188.28 million kWh of electricity generated, CJSC “Armenian Nuclear Power Plant” accounted for 2,829.98 million kWh, or 30.79%.[18]

Currently, Armenia's energy policy has changed, and the emphasis has shifted toward solar energy. At the same time, nuclear energy remains a key component of the energy development strategy.

ANPP Waste

Before the dissolution of the USSR, spent nuclear fuel (SNF) was transported outside Armenia to Russia. Subsequently, due to the blockade of Armenia, it became impossible to transport SNF by rail. A special storage facility was constructed at the ANPP using French technology with the support of Framatome. After the fuel is removed from the reactor core, it is stored for an extended period in the plant's cooling pool in wet conditions, during which residual heat generation and nuclear interactions are substantially reduced, after which the fuel can be stored under air-cooling conditions. Protective casks are used to reduce the level of ionizing radiation.

"The storage period for nuclear fuel can be continuously extended as long as it can be cooled. If necessary, additional storage facilities will be constructed. With regard to spent fuel control, we conduct annual inspections jointly with inspectors from the International Atomic Energy Agency. As for waste containing other radioactive materials, it is transferred to a temporary storage facility for neutralization," explains Khachatur Khachikyan, Chairman of the Committee for Nuclear Safety Regulation under the Government of Armenia[19].

In 2024, specialists from the Russian state corporation Rosatom, with which the ANPP has contractual relations, examined the storage facility to assess the safety of its continued operation.

At present, the storage facility is full, and the construction of an additional storage facility is being considered.

ANPP Water Supply

The VVER-440 reactor type requires large amounts of water. Initially, the ANPP was supplied with water from the Sev Jur River and Lake Akna Lich, which are fed by underground water sources of the Ararat Valley. Excessive exploitation of groundwater resources has created a threat to the entire Ararat Valley water basin:

- The flow of the Sev Jur River has decreased 10–12-fold;
- Artesian pressure has decreased twofold;
- The groundwater level has fallen by 17 m;
- There is a high risk of Lake Aygyr drying up.

As of 2016, the water resources of the Ararat Valley artesian basin had decreased by 170 million cubic metres. As a result, the vulnerability of the groundwater basin to emergencies increased[20].

Public Monitoring of the Protection of the Population Living in the ANPP Impact Zone

The EcoLur Information NGO conducts monitoring of the preparedness of the population and state authorities to ensure safety in the event of an ANPP accident in 25 settlements located within 5–10 km of the ANPP.

The results of EcoLur's monitoring showed that the safety of the population in communities affected by the ANPP is not fully ensured as required by legislation. Community medical centres and residents do not have stable supplies of iodine preparations for thyroid blocking.

Residents lack personal protective equipment, including filtering gas masks and respirators.

The settlements lack shelters, protective structures and other facilities provided for under the National Plan.

Basements and sports halls designated as temporary shelters do not meet the basic requirements for rooms and buildings protected against radiation hazards[21].

Extension of the Operating Life of the Existing ANPP

The existing ANPP Unit 2 was commissioned in 1980. It was shut down in 1989 and restarted in 1995. Its operating life is 30 years. Taking into account the reactor shutdown period, its operating life expired in 2016.

Already at that time, the issue of extending the operating life of ANPP Unit 2 arose, for which extensive modernization and refurbishment works were carried out. Vahram Petrosyan, Director General of the ArmAtom Research Institute and Chairman of the Board of Directors of CJSC "Armenian Nuclear Power Plant", provides the following explanation.

"We faced two main tasks. One was related to the pipes of the plant's primary circuit, in order to prevent possible leaks. The other task was to inspect the reactor metal. We chose the metal annealing option, which was carried out at a temperature of 475 degrees. Both tasks were completed. As a result, we obtained a conclusion substantiating that the plant can be operated until 2039," concluded Vahram Petrosyan.

Officially, the operating life of ANPP Unit 2 has been extended until 2026, and there are grounds to expect that it may be extended for another 10 years, until 2036.[22]

Selection of a New Nuclear Power Plant

In 2009, the Armenian Parliament adopted the RA Law "On Construction of a New Nuclear Power Unit" with a capacity of 1,200 MW.[23] This raised many questions among the public, experts and communities in the impact zone, which remained unanswered. First, the proposed capacity was three times greater than that of the existing ANPP. In this case, the new ANPP would become the main electricity supplier and occupy a monopoly position, jeopardizing the policy of diversification and energy independence.

The availability of sufficient water supply is also a problem. According to the project for the construction of the new ANPP on which the law was based, the site of the existing ANPP was selected, i.e. an area with extremely limited water resources (see above).

The law has not yet been repealed, but for a long time there have been discussions about the possibility of constructing small modular reactors. In order to discuss issues related to the construction of a new nuclear power unit in Armenia, the feasibility of deploying small modular reactors, as well as to conduct an analysis for selecting the necessary technologies and determining the sequence of further steps, the Government of the Republic of Armenia adopted Decision No. 601 on June 6, 2023, establishing a special interdepartmental commission.

Two months after the adoption of this decision, on August 5, 2023, experts participating in a professional roundtable organized by the NGO "Armenian Energy Initiative" stated that discussions about small modular power plants were premature, unsubstantiated and represented a solution with no prospects for Armenia.

Armenian energy specialists propose modern technologies to address this issue. Since 2000, the Armenian company "Ecoatom", in cooperation with French reactor-development specialists, has proposed abandoning pressurized-water reactors and introducing new reactor technologies based on molten salts.

According to Gagik Martoyan, Director of "Ecoatom", who works in this field, the new technologies would not only improve safety but also address the issue of spent nuclear fuel, which could be used in next-generation reactors.

There is no doubt that, despite expert assessments, the decision on the choice of a new nuclear power plant will be a political one.

Taking into account recent global trends, it is necessary to develop a public assessment of nuclear energy policy based on a balanced approach and assessments of the green transition.

From this perspective, we propose considering the energy component of climate policies without defining particular energy sources as "climate-friendly". The only negative criterion should relate exclusively to fossil fuels, whose climate impacts are well known and do not require additional research.

We believe that nuclear energy has specific characteristics that are not inherent in other forms of energy and therefore should not be assessed using traditional indicators, including climate indicators. However, given that nuclear energy has been included in the list of climate-friendly energy sectors for political reasons, we consider it essential to establish requirements with a climate-related focus: compliance with climate commitments, impacts on natural resources, harmonization with adaptation and mitigation programmes, and alignment with national NDCs.

We consider it necessary to increase transparency in decision-making in the nuclear energy sector, particularly regarding the protection of the population, radiation safety, and the social needs of vulnerable populations living in the impact zones of nuclear power plants. We consider it necessary to present for public discussion measures concerning radioactive waste and its safe management, as well as political decisions related to counter-terrorism measures and military actions.

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