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# UNVEILING METSAMOR: NAVIGATING THE SOUTH CAUCASUS AMID NUCLEAR CONCERNS

## (METSAMOR'UN SIRLARINI AÇIĞA ÇIKARMAK: NÜKLEER TEHDİTLER ARASINDA GÜNEY KAFKASYA'YI ANLAMAK)

**Mohammad Reza PASHAYI***

**Abstract:** *The establishment of the Metsamor Nuclear Power Plant (Metsamor) nuclear facility in the Armenian SSR during the Soviet era added a new dimension to the geopolitical landscape. Ostensibly built for the production of nuclear energy, the plant actually caused numerous difficulties over the course of eight years.*

*Metsamor's post-earthquake damage combined with radioactive problems to cause global concern. Moreover, the region has become a source of international concern due to the dual nature of Metsamor, both contributing to energy production and providing material for nuclear weapons. The confluence of factors such as ecological fallout, seismic events, nuclear waste and the specter of nuclear weapons has led to deep and widespread concerns at regional and global levels.*

**Keywords:** *Metsamor, Radioactive Leakage, Nuclear Dump, Environmental Problems*

* ORCID iD: https://orcid.org/0000-0001-7022-8017
PhD Candidate Mohammad Reza Pashayi, Department of European Union Studies, Süleyman Demirel University, E-mail: d1940262014@ogr.sdu.edu.tr

**Öz:** *Sovyet döneminde SSR Ermenistan bölgesinde Metsamor Nükleer Enerji Santrali'nin (Metsamor) kurulması jeopolitik manzaraya yeni bir boyut kazandırdı. Görünüşte nükleer enerji üretimi için inşa edilen tesis, aslında sekiz yıl boyunca çok sayıda zorluğa neden oldu.*

*Metsamor'un deprem sonrası hasarı radyoaktif sorunlarla birleşerek küresel endişeye neden oldu. Dahası, Metsamor'un hem enerji üretimine katkıda bulunan hem de nükleer silahlar için malzeme sağlayan ikili yapısı nedeniyle bölge uluslararası bir endişe kaynağı haline geldi. Ekolojik serpinti, sismik olaylar, nükleer atıklar ve nükleer silah hayaleti gibi faktörlerin bir araya gelmesi, bölgesel ve küresel düzeyde derin ve yaygın endişelere yol açmıştır.*

**Anahtar Kelimeler**: *Metsamor, Radyoaktif Sızıntı, Nükleer Çöplük, Çevre Sorunları*

## Introduction

After World War II and during the Cold War, a significant battleground expanded between the Eastern and Western blocs, especially centered on nuclear advancements. This rise in hostility and rivalry was triggered by the United States' use of the atomic bomb in Japan to end the war and to send a message to the Eastern Bloc enemy, the Soviet Union. Although the atomic bombings in Japan's Hiroshima and Nagasaki happened in the past, but the pursued nuclear arms race remained unabated between the Western and Soviet Blocs throughout the chaotic and tumultuous years of the Cold War. This dynamic, the nuclear arms race between the United States and the Soviet Union, has led to a perception of a "balance of terror", a fear of mutual annihilation and total annihilation in a possible nuclear war for both sides and the world. The Soviet Union began to witness its initial successes in nuclear energy in 1949. The Obninsk channel-type reactor, the USSR's first nuclear power plant, was constructed in Moscow in 1954 to provide strategic nuclear capabilities (Petros'yants 1984, 42). This facility was the world's first operational nuclear power plant (Semenov 1983, 47).

In addition, investments in nuclear technology and advancements in nuclear production led to the construction of functional power plants that could be sold or used for commercial purposes in many republics that were part of the Soviet Union, including Armenia (Zheludev and Konstantinov 1980, 34). Armenia's Metsamor Nuclear Power Plant was built using what is often described as first generation Soviet technology. In the 1970s, Metsamor was constructed as two split units, Metsamor-1 and Metsamor-2, to meet the growing energy demands of the copper and aluminum industries in Armenia (Yuksel 2014, 4). The construction of the Metsamor-1 launched in 1973, with claims that "the Armenian nuclear power plant has been designed for seismic conditions and is, therefore, more expensive" (Semenov 1983, 50). It became operational on December 28, 1976. The target was to produce over 880 MWK of electricity (IAEA 152). The Metsamor-1 had the WWER 440/V230 type as reactor and a capacity of generating 416 MWe (Nuclear Power in Armenia 2023). This type of reactor used in Metsamor-1 is considered a primitive reactor carrying a higher risk than the Chernobyl Nuclear Power Plant in Ukraine. The Metsamor-2 is equipped with the WWER 440/V270 type reactor, completed three years later in 1979, with a power output of 400 MW (Ogan 2007).

The Soviet Union, after the 1970s, became a prominent manufacturer of nuclear power plants using four different types of reactor models in

their construction. These reactors included VVER, PBMK, EGP, and BN. Especially the years after 1986, which means a period of about 40 years, most of the reactors based on the VVER-type reactor, also used at Metsamor, are considered most unsafe and the most disposed to accidents among these Soviet reactor models (Stefanova, Chantoin and Kolev 1995, 270; Cabbarli 2003, 241). The Metsamor 1 reactor, which was built with the old technology, was also not earthquake resistant. The dangerous part of the Metsamor 1 is that it is located in the city of Hoktamberyan, which is located on the Agri Mount fault line, that is potentially hazardous (Lavelle and Garthwaite 2011). Adding to the lack of an earthquake-resistant system in the first reactor, the decision to build the plant based on political considerations, despite numerous warnings from Soviet scientists during its construction, made it vulnerable to unforeseen disasters, such as an earthquake (Zulfugarov and Babayev 2012, 234). In spite of the first unit, Metsamor 2 reactor is claimed to be resistant to an earthquake of magnitude 8 (Nadirov and Rizayev 2017, 47-48; Ozdasli 2016, 50). But the challenges go beyond seismic concerns and often stem from political, strategic or power-related factors that are of international or regional interest. The fact that the construction of the Metsamor plant ignored scientific warnings, rather than purely technical or security concerns, reflects a broader political calculus in which strategic, economic or regional interests take precedence over security and expert advice. Moreover, the possible consequences of ignoring the earthquake-resistant system at the first reactor underscore the need for a comprehensive re-evaluation of all security and safety procedures at Metsamor to successfully lessen both natural and man-made risks. However, a significant portion of the primary documents on the deployment of Soviet and post-Soviet Armenia's nuclear energy and weapons on the territory of Armenia are not accessible in primary sources. As a result, the information and documents are based on the analysis of secondary sources or research, and this article focuses on only one aspect of the history and potential developments of Armenia's nuclear power plant in the Soviet and post-Soviet period. The economic importance and nuclear energy potential of Metsamor for Soviet Armenia and beyond is emphasized. But why does Armenia persist with its nuclear activities at Metsamor, despite being aware of the potential catastrophic consequences similar to Chernobyl?

## 1. Armenia's Economic Dependence on the Armenian Diaspora, Russia and the EU

Since gaining independence in 1991, Armenia has been dependent on Russia for energy, security, military and border protection, but has preferred

rapprochement with the West, especially in economic matters, largely due to the influence of Armenian diaspora activities in the US and the EU (Socor 2013). Due to Armenian irredentism, the occupation of Azerbaijani territories and the Karabakh war, economic difficulties and a low average income, Armenia relies on the help of the Armenian diaspora in the US, EU and Russia as a source of income. In 2005, Armenians living abroad were granted dual citizenship, and 2 million Armenians living in Russia were allowed to vote. Diaspora and Working Armenians who do not reside in the country have the right to have a voice in the elections (Karabayram 2011, 287). The fact that Armenia strategically navigates the complexities of leveraging economic benefits from both the Diaspora and Armenians working abroad. The Diaspora, seasonal workers going to Russia and other countries, and donations from states and international organizations play an important role in keeping Armenia's budget afloat. In cases such as Metsamor, where Russian investments and influence are significant and Armenians cannot repay their debts, Russia's significant external influence on Armenia is evident (Goksel 2012, 45). This underscores the broader geopolitical leverage Moscow exerts in the region, which is often intertwined with Armenia's economic vulnerabilities and political decisions.

Armenia's Western adventure accelerated with the annexation of Abkhazia and Ossetia in 2008, the annexation of Crimea to Russia in 2014, and the loss of the Second Karabakh War, in which Armenians invested politically and militarily for three decades. Armenia's Western-oriented foreign policy and pursuit of economic integration with Europe is part of a broader strategy aimed at pitting Armenians in both the US and the EU against Russia and, if necessary, protecting itself from Russian influence by aligning with the Western bloc. This strategic approach is not unique to Armenia but has spread to other countries in the region. Georgia follows the same policies, while Azerbaijan tries to maintain a balance. Despite its relations with the West, which values its security, Armenia has never severed ties and maintains a careful relationship with Russia. Moreover, Armenia has developed a model of multilateral relations not only with the West but also with Russia and Iran for various natural gas products, reflecting Armenia's successful efforts to diversify its economic interests beyond raw materials (Saha et al. 2018, 3). At the same time, Armenia is trying to improve its dialogue with the European Union by participating in various EU institutions and organizations. In the aftermath of the Karabakh War, Armenia's agreement to sit at the peace table with Azerbaijan and Türkiye was a necessary step to de-escalate decades tensions, ensure regional stability, and address protracted conflicts that impede economic growth and regional and international relations. As a result,

since 2020, European countries, notably France, have further complicated the delicate balance of power and diplomacy in the South Caucasus by increasingly advocating for a more active role in shaping Armenia's Western-oriented foreign policy, including calls for military support to strengthen Armenia's position in the region and efforts to integrate the country into the EU.

### 1.1. Metsamor Nuclear Power Plant's Role and Energy Crisis:

Metsamor, Armenia's only nuclear power plant, has been described by the European Union, the United States, and numerous international organizations as the "most dangerous nuclear power plant" worldwide due to its old Soviet-era design and lack of robust modern safety mechanisms (Hadzhieva 2016). Despite these pressing concerns, Metsamor remains an indispensable component of Armenia's energy infrastructure, providing around 40% of the country's electricity and thus reducing its dependence on foreign energy sources (Dixit 2019).

Historically, during the Soviet era, Armenia's natural gas needs were met through imports from Turkmenistan, facilitated by a trans-regional pipeline through Azerbaijani territory. However, the collapse of the Soviet Union profoundly altered the geopolitical landscape and triggered a series of diplomatic and economic challenges for Armenia. Yerevan's irredentist policies, coupled with persistent international lobbying to advance its so-called genocide claims, exacerbated regional tensions. Moreover, Armenia's occupation of around 20% of Azerbaijan's internationally recognized territory, including Nagorno-Karabakh and seven surrounding regions, has led to a serious deterioration in regional and global diplomatic relations. This not only led the closure of the borders between Türkiye- Armenia and Azerbaijan-Armenia, but also strategically led Azerbaijan to impose an embargo on Turkmenistan's natural gas exports to Armenia. As a result, Armenia found itself grappling with an acute energy crisis and further strengthened its dependence on the aging and unstable nuclear infrastructure of Metsamor.

### 1.2. Energy Crisis Resolution and Restarting Metsamor:

Armenia's presence in the South Caucasus, despite being a small power, is linked to the interests of many global powers and its two neighbors, Iran and Russia. They do not seek to save Armenia, but they would never dare to

abandon it or allow it to be destroyed. The oscillation between salvation and ruin helps them maintain a balance in the region, countering Azerbaijan and Türkiye. Consequently, in the face of Armenia's energy crisis, Russia and Iran emerge as its "saviors"—Russia by restarting Metsamor to provide nuclear energy resources, Iran by supplying natural gas, and both offering military support. Both Russia and Iran are aware of issues in the region. Russia is fully cognizant of the possible radioactive leakage and environmental risks at Metsamor, while Iran knows it is acting in contradiction to Articles 3/16 and 154 of its constitution, which declare that it "supports the just struggles of the "mustad'affun" against the "mustakbirun" in every corner of the globe" (Iran's Constitution 1989). While Armenia is not among the "oppressed", but rather the aggressor that occupied the territories of an Islamic country for decades, causing the displacement of nearly a million Azerbaijanis, Iran has, nonetheless, supported and continues to support Armenia. In addition to the energy crisis following both the closure of the borders and the interruption of Turkmen gas, Armenia's energy problem was also caused by the sabotage of power lines from Georgia to Armenia by Azerbaijani troops during the war (Ustohalova and Englert 2017, 23). Fully aware of the risks associated with possible radioactive leakage and environmental insecurity, Armenia decided to restart the Metsamor plant. Despite military and financial support from the Russians and Iranians during the conflict with Azerbaijan, Armenians' main concern in restarting the damaged plant was the urgent need for energy.

After the collapse of the Soviet Union, Russia not only maintained its supremacy and dominance over the newly independent republics through economic or military mechanisms such as the CSTO, but also consistently opposed the intervention of global and non-regional powers seeking to influence the South Caucasus in order to protect its own strategic interests and prevent its neighbors from forming alliances with Western powers. These included the US, the EU, Türkiye and Iran. The issue of "nuclear energy security" therefore became a focal point for the European Union, especially due to post-security nuclear concerns about Soviet-built nuclear power plants in the east of the continent and their impact on fuel, energy and the environment. As a result, after 1991, Russia under President Boris Yeltsin moved closer to the West and this change was welcomed by Armenians, who wanted closer relations with the West.

In the early days of independence, the EU supported calls for the closure of the Metsamor plant, citing earthquake risks in the region and the end of its operational life. Following the reopening of the plant despite opposition

from various opponents, an important agreement was signed between EU representatives and Armenia in Brussels in September 1999. As a result of this agreement, accepted by the Armenians, it became obligatory to shut down Metsamor by 2004 (Ogan 2007). However, Armenia's strategic bargaining tactics, led them to demand €1 billion in exchange for the closure of the facility, a demand rejected by EU representatives who offered €100 million. Years later, the goal of shutting down the Metsamor was also not achieved, "nevertheless, the EU contributed to upgrading the safety of the plant and strengthening the nuclear regulatory authority" (Mills 2020, 65). All these years, Armenia has characterized these pressures as coming from a "hostile country", either because it did not take them seriously or because it attributed them to the influence of Azerbaijan and Türkiye. As a result, they found support from the EU and the US in the international arena due to Armenian Diaspora and were able to efficiently use the Metsamor question in their favor. Thus, we find Armenia engages a dual strategy, convincing the EU and senators in the US while at the same time employing tactics to turn the situation in its favor.

The war, which directly affected the Armenian economy due to the economic blockade imposed by Azerbaijan and Türkiye, led to an increase in energy prices and thus caused significant difficulties for the Armenian economy (Cabbarli 2003, 237). Due to Armenia's economic collapse during the First Nagorno-Karabakh War (1988-1994) and in the following years, Armenia became completely dependent on Russia for energy. Iran's support for Armenia, particularly in the economic and energy sectors, was driven by a combination of strategic imperatives, notably the determination to avoid being marginalized by Azerbaijan. This support was significantly influenced by Iran's regional policies aimed at maintaining its influence in the South Caucasus, balancing its opposition to both Türkiye and Azerbaijan, and securing access to Central and South Asian markets through strengthened ties with Armenia. Moreover, Iran has always considered Karabakh as a part of Azerbaijan but wanted it to be occupied by Armenia as it profited from the conflict between the two countries, thus Iran's openly siding with Armenia after the Second Karabakh War has further increased the complexity in the region and the search for a solution. Armenia's stubborn occupation policy and its attempt to manage its ever-increasing energy costs by ignoring the Four Resolutions enacted by the UN have also added to its difficulties, resulting first in Armenia's indebtedness through bilateral agreements with Russia, and then in Russia's control of Armenia's economy, military and energy sector, including border controls.

Armenia has been in negotiations with the EU on the decoupling of the Metsamor Power Plant. "Previously, the EU had made several calls for the plant and similar facilities in Bulgaria, Slovakia and Lithuania to be shut down. All but Metsamor were closed" (Fotyga 2017). At each stage, the plant not only did not close, but continued to operate in 1995 and the following years with financial support from the EU. The Metsamor has been the subject of controversy, with some arguing that by closing it, Armenia is using it as leverage to secure financial and military funding from EU countries (Mills 2020, xv). Therefore, a proposed solution to address concerns about the old plant is the construction of a new one (Kovynev 2015). The possibility of shutting down Armenia's old Metsamor and constructing a new reactor have been ongoing for several years and remains a question of speculation. Despite calls for action due to the perceived dangers associated with Metsamor, Western countries have refrained from imposing sanctions on Armenia. Nonetheless, Western countries have sided with Armenia in the international arena. In contrast, Türkiye and Azerbaijan have voiced their concerns about Metsamor in international forums, accusing Western countries of double standards. Whatever the different positions, the geopolitical context in the South Caucasus plays a role in triggering the reactions of many countries to the Metsamor issue, resulting in a complex and nuanced diplomatic panorama in the Caucasus region. Despite recognizing the significant risks associated with Metsamor, the West has refrained from imposing sanctions on Armenia, limiting its reaction to mild criticism. This tolerance reflects Armenia's historically favorable position in Western diplomatic relations in the Caucasus.

### 1.3. Double Standards and Armenian Non-Compliance:

Throughout both Karabakh Wars and following the liberation of its occupied territories, Azerbaijan has expressed concern over Armenia's inconsistent adherence to international commitments, treaties and legally binding agreements, highlighting a selective interpretation pattern that undermines the credibility of negotiated settlements. Following the Second Karabakh War in 2020, Armenia was accused of strategically prioritizing Article 6 of the ceasefire agreement while failing to comply with Article 9, designed to enhance regional connectivity and serve as a cornerstone for the post-war peace process. Notably, while the corridor envisioned to connect mainland Azerbaijan to Nakhchivan has yet to materialize, the discourse around a transportation route to Karabakh has been reframed in international narratives as the 'Lachin Corridor'— a term that has been widely disseminated despite

referring to an infrastructure crossing located on Azerbaijan's sovereign territory.

Armenia's approach to its obligations under the Metsamor power plant agreement with the EU exemplifies concerns about selective implementation of commitments. While the agreement sets out a framework for the eventual decommissioning of the plant, Armenian officials have argued that its closure is contingent on either the construction of an alternative plant or the provision of €1 billion in financial assistance. Moreover, Armenia's energy negotiations are intertwined with broader geopolitical considerations, as policymakers have actively sought to use these discussions to gain concessions, such as the lifting of embargoes imposed by Azerbaijan and Türkiye, the reopening of borders, and the construction of a pipeline to facilitate the export of Iranian gas to Yerevan. These diplomatic maneuvers were perceived as efforts to gain unilateral advantages without addressing the historical context of Armenia's occupation of Azerbaijani territory or its ongoing territorial claims against Azerbaijan and Türkiye as enshrined in the constitutional framework.

### 1.4. Armenia's Dilemma: Economic Challenges and Nuclear Concerns

The collapse of Armenia's economy, coupled with regional ecological inequality, possible radioactive leakage and even the threat of a latent explosion of the Metsamor Power Plant, highlighted by the Armenian authorities following the war and ceasefire, is leading them to prioritize and deal with economic challenges (Yüksel 2014, 4, 2020, 17; Ornarli 2011). As expressed by Paul Brown, "The Armenian government restarted the Metsamor reactor in 1995 after closing it in 1988 when a nearby earthquake killed 25,000 people. The move came after four years of power cuts which left most of the population without heating through the winters. The plant provides one-third of the country's electricity" (Brown 2004). Armenian officials openly accepted this approach, especially during the restart of the plant. However, in the following years, situations such as "EU halts aid to Armenia over quake-zone nuclear plant" have arisen. Often, ecological issues related to the Metsamor nuclear power plant have often been reinterpreted through the Armenian government and its lobbying in the US and EU, diverting attention away from the actual environmental damage caused by the plant. These efforts have led to the denial of the ecological damage caused by radioactive leaks and the release of radioactive waste and the discharge of contaminated wastewater into nearby rivers (Dermoyan 2021). Despite Armenia's efforts

to downplay these concerns, independent monitoring organizations, radiation detection systems, and ecological realities in the region have played important roles in revealing the extent of environmental contamination and raised alarm in the international community about the risks associated with Metsamor's activities.

Areg Galstyan considers the closure of Metsamor in 1988 as "a big mistake that created an energy crisis and inflicted suffering on the people and the economy" (Brown 2004). Dr. Antonyan, shedding light on the real justification, stated that, "As a citizen, I can say we do not have an alternative power supply, so we should operate the reactor now. As far as the future is concerned, I would say in a seismic area we should not have a nuclear plant" (Brown 2004). As Torosyan argues, "Despite what politicians and diplomats say, many Armenians see the decision to prolonging Metsamor's lifespan as symptomatic of the general difficulty the government has had in tackling the country's persistent economic woes, especially unemployment and inflation. Still, others cannot believe that the government would 'play with nuclear safety,' so to speak" (Torosyan 2012). Politicians and ordinary citizens are united in recognizing the lack of safety of the facility, given the seismic activity in the region. However, Armenians believe, the lack of viable energy alternatives leaves no choice but to keep the lights on, even in the face of potential dangers to both the environment and the region.

After the decree on the reopening of Metsamor in 1995, Armenia and Russia signed the Protocol on cooperation in the field of nuclear energy on June 6, 2000. But financially collapsed Armenia has had a difficult time paying for uranium as fuel, which it receives from Russia. Later, as the debt increased, Armenia was forced to hand over its assets to Russia in 2002, including Nairit, Mars (the largest defense industrial facilities), the Hrazdan hydroelectric power plant and five other important industrial facilities, and paid off its debt of $ 101 million. Due to these financial constraints, Russia decided to transfer Metsamor's shares to UES (Russian Electric Systems), a Russian company operating in the field of nuclear energy. As the debts grew, Armenians had to transfer ownership of the Power Plant to the Russians (Ogan 2005, 110). This did not only mean that the fuel was from Russians, but also that the Power Plant was owned by Russians, and the electricity produced was sold to Armenians. In 2006, Emil Danielyan wrote that "UES already owns a cascade of Armenian hydroelectric plants and manages the finances of the nuclear power station at Metsamor" (Danielyan 2006). In this situation, Armenia, like all countries in the region, became a victim of Russia's exploitation policy.

In this context, Armenia has become more dependent on Russia's energy influence and strategic economic policies than any other country in the region.

In the aftermath of this energy and economic crisis, Armenia faced long-lasting consequences, grappling with the loss of key state assets and industrial facilities due to its inability to manage its mounting debt. This highlighted Armenia's difficult financial situation at the time.

The main concern about the Metsamor nuclear power plant is the potential for earthquake-related damage and subsequent risks of radioactive leakage, particularly following the 1988 Spitak earthquake. The Armenians insist on the issue that there was no damage and that it was pointless that the Plant was closed for seven years. During these years, the European Commission was also concerned about the safety of the Metsamor plant. In a report published in March 2015, the EU called on Armenia to take action on the Metsamor issue related to the Implementation of the European Neighborhood Policy in Armenia; "The early closure and decommissioning of the MNPP (Mezdamor Nuclear Power Plant) remains a key objective for the EU and under the ENP Action Plan. Since the power plant cannot be upgraded to meet current internationally recognized nuclear safety standards, it should be closed as soon as possible. The new power plant should comply with the latest international safety standards" (Joint Staff Working Document 2015). However, the same year, Armenians had discussions with Russians regarding the renovation and extension of the lifespan of the facility, which was expected to be closed in 2008, were conducted with the Russia-Armenia Treaty in 2014. In December 2015, despite the European Union's readiness to provide a $289 million loan for the decommissioning of the plant, Armenia and Russia signed a financial agreement that allows Moscow to allocate a $270 million loan and a $30 million grant for the modernization of Metsamor. This agreement with the financial and technical assistance provided by Russia in 2015 also ensured to extend the operational life of the Metsamor NPP until 2026 (WNN 2014; Miholjcic, 2018: 42). In 2018, when the pro-Western Prime Minister Nikol Pashinyan was elected to power, he initially pursued a policy of balance. The reconstruction of Metsamor was once again in question, and this time, the Armenians announced that they would not incur debt to Russia, opting instead to fund the reconstruction themselves. On June 10, Prime Minister Pashinyan declared Armenia's decision to decline the Russian loan and conditions for the modernization of the Soviet-built Metsamor plant, but instead finance it within the Armenian state budget (RFE/RL's Armenian Service 2020). The decisions were made before the Second Karabakh War. Therefore, we find

these days is included in the records that the EU and the United States have long pressed for the closure of the nuclear power plant on the grounds that it does not meet safety standards (RFE/RL's Armenian Service 2020). However, pursuing the 2020 Karabakh War and the Russians assuming a neutrality for the first time, followed by Armenia's defeat in the war, the country felt abandoned. Armenians did not disregard Russia despite their move to the West after 2020. But at the same time, Pashinyan's taking sides against Russia and the government's announcement that it could choose equipment and service suppliers for the plant, which generates about 40% of Armenia's electricity, were the foundations for cutting it off from Russia and taking over the Western side as well.

With the 2015 Russia-Armenia Agreement, Metsamor's lifespan was extended to 2026. In 2021, under Rosatom's regulation, the plant had to undergo a 141-day shutdown to extend its operational life. Furthermore, Russia's economic influence in the South Caucasus, including Armenia, has increased significantly. However, after the Second Karabakh War and with the liberation of the occupied Azerbaijani territories, Armenians were deterred from irredentist policies towards neighboring states. Instead, they sought to establish closer relations with the United States and the EU, which had already been initiated. On May 2, 2022, they signed a Memorandum of Understanding on Strategic Civil Nuclear cooperation with the United States. However, on December 14, 2023, a "decision" was reported by Armenian media, stating that the Cabinet in Armenia formally approved plans to spend $65 million "to modernize the Metsamor plant and extend the lifespan of the second reactor until 2036" (Zartonk Media 2023; news.am Staffs 2023). The repair and maintenance of the reactor will be conducted by "Rosatom" service engineers. All of this implies that "Rosatom Service will upgrade Metsamor from 2023 to 2026" to lengthen the reactor's life, which was initially scheduled to end in 2026.

In fact, the Armenian Government intends to construct a new block to replace the existing nuclear power plant or a new nuclear power plant. In this context, the early shutdown of the Metsamor has also not materialized in recent years "due to the lack of necessary replacement capacity–whether fossil or renewable that could ensure energy security. But the EU provided important support to enhance nuclear safety in Armenia" (Mills 2020, 66). Armenia acknowledges that, with Metsamor in operation, it remains entirely dependent on Russia for nuclear energy. To diversify its options, Armenia observes the construction of a second Nuclear Power Plant, but constructed with Western collaboration, as an escape route.

Armenians are aware of the need for a period of 6-10 years to construct a new nuclear power plant block or a new nuclear power plant. Armenians are aiming to construct a new power plant, generate electricity from it, complete the construction of the new nuclear power plant by 2036, and then to reach a point where they can safely decommission Metsamor, a nuclear facility that has raised significant security concerns in the region. Therefore, it is imperative to start work on updating the old Metsamor to facilitate the construction and completion of the new facility by 2026.

Russia's longstanding presence in the Caucasus region continues to shape its relations with Armenia. In addition, the Russia-Ukraine war, the European Union's growing distancing from Russia, and Western sanctions, especially on the export of technology and semiconductor sectors, have created opportunities for Armenia to play a more active role in the re-export of European products to Russia.

In almost two years, Armenia's technological imports from the EU have increased significantly. The reason behind this surge is their intention to re-export the goods they import to Russia without causing them to be transported to Russia, thus engaging in trade for war profits as a bridge between the EU and Russia. Therefore, Ukraine has become dependent on the material, military, technological and intelligence resources of the United States and the EU, and the EU has imposed the same sanctions on Russia as the United States. These circumstances could potentially have negatively charged repercussions on Russia's energy influence in both the EU and the Caucasus. Armenia, which has historically been reliant on Russia in various aspects, possibly will be affected by such uncertainties. Furthermore, Russia funds, repairs, and maintains Metsamor, leaving Armenia dependent on Russian support for the energy it desperately needs.

In reaction to such challenges, Armenia has tried to adjust its energy policy and choose new steps to moderate its energy dependence on Russia. This issue of energy independence is being discussed during the meeting between Armenian Foreign Minister Ararat Mirzoyan and US Secretary of State Antony Blinken in Washington in December 2022. Armenia seeks to enhance energy security cooperation with the United States. To establish this commitment, a Memorandum of Cooperation and Understanding was signed, which aimed at strengthening economic and diplomatic relations between the two countries. The agreement between Armenia and the United States introduces numerous questions and outlooks about the future of the Metsamor Plant not only for

Armenia, but also for its near and distant neighbors and those affected by this power plant. There is also a commitment to further develop nuclear energy in the coming years, an issue that will probably become evident in the agreements with the United States. In accordance with this, the Armenians arranged to establish contacts with possible investors in Armenia's nuclear energy technology in order to construct a new nuclear power plant in the country (WNN, 2015). Due to Armenia's geopolitical importance in the region, its position attracts the interest not only of Iran, Türkiye and Azerbaijan, but also of various international and regional powers. The challenges posed by this deteriorating power plant affect all the states involved.

In this Agreement, as of 2023, all repairs, equipment modifications, maintenance, and personnel training will be carried out by Rosatom, and inspections will be conducted by Rosatom too. As we will find in the repairs in the coming years, the same conditions were included in the agreement by Russia. Armenia is facing an energy shortage, acquiring natural gas from Iran and Russia. After the Second Karabakh War, particularly following September 19, 2023, which saw the liberation of all of Karabakh, including Khankandi and the remaining territories, and the disarmament of separatist forces, Armenians observed losses and attributed the situation entirely to the Russians. There were even rumors that the sale of Russian gas to Armenians could be stopped if Armenians pursued more pro-Western policies. As Zolyan noted at Carnegie, "any Armenian steps toward the West tend to be perceived as a hostile act in Moscow. And the Kremlin still has plenty of ways to exert influence over Yerevan: it could give the green light to Baku to launch another military operation, halt natural gas exports, or deport ethnic Armenians from Russia, for example" (Zolyan, 2023). However, this issue was not officially confirmed. Russia, Armenia's traditional strategic ally, fulfills the majority of Yerevan's gas supplies, with Armenia generating up to 98 percent of its electricity locally. However, Armenia's "self-sufficiency depends on the countries from which we import the gas and the uranium that operate our thermal and nuclear power plants." (Burada kaynak belirtmek lazım) In essence, there is a hidden dependence on both Russian gas and fuel for the Nuclear Plant to produce electricity despite assertions of independence. Although Armenian government officials emphasize self-sufficiency, they overlook the intricate energy supply chain. As Armen Manvelyan points out, "in fact over 70 per cent of Armenia's electricity depended on Russia" (Markosyan 2023). Therefore, as after 1988, despite the numerous dangers, both the state and the Armenian people are unwilling to decommission the plant, due to Armenia's economic needs and the economic and energetic

difficulties that decommissioning Metsamor would create. The only concrete plan is that Armenia has repeatedly attempted to significantly extend the life of Metsamor to eliminate its energy deficits and improve its current energy security.

Due to the economic dependence of Armenia, the problems between Russia and Georgia, the closure of Georgia's borders with Russia and Armenia with Azerbaijan, and the transportation of uranium from Russia to Armenia by airlines for the fuel needs of a damaged power plant, the nuclear danger has always existed for the region. Therefore, the transportation of this fuel by air raises concerns, as aircraft could potentially be involved in carrying nuclear material, resembling a nuclear bomb threat on every trip. This is predominantly worrisome given the immediate halt to the Second Karabakh War by shooting down a Russian helicopter and the incidents like the one-day Khankendi Operation, where a Russian military vehicle was driven into Azerbaijani positions, resulting in casualties for Russian soldiers but caused the war or the operation stopped. In the event of any aircraft malfunction, a scenario involving a plane crash and the transfer of nuclear fuel to the South Caucasus becomes a significant concern. Evacuation to any region in the Caucasus may also be part of an inevitable scenario.

## 1. The potential disaster and consequences of an event like Chernobyl in Metsamor

The Metsamor, located next to the borders of Türkiye, Azerbaijan and Iran. This old, damaged and Soviet technology plant from 1976 is now considered the most dangerous nuclear power plant in the world (Puiu 2017). According to international regulations, nuclear power plants should be at least 80 kilometers away from settlements (Philip 2014, 4; IAEA 2006, 154). Metsamor poses a greater risk to neighboring countries than Yerevan. It was built in an earthquake-prone area and was closed for many years due to the 1988 earthquake. Therefore, the Metsamor is another important issue in Türkiye Armenia and Azerbaijan-Armenia relations, although it has not been discussed extensively at both regional and international levels. In addition, in the event of an accident or technical malfunction, Armenia would be the only country responsible for the events, even if the safety and security of the plant is certified by the IAEA or EU countries. But the one undeniable fact is that this has potentially disastrous consequences for the South Caucasus. The persistent decisions for Metsamor's reoperation activities appear to be based

on political and economic rather than scientific concerns. While Armenian politicians are aware that the power plant's technological lifespan ended years ago and its current location is no longer safe due to earthquakes, they persist in continuously revamping its activities.

Despite ongoing risks and criticism, as well as scrutiny from Western foreign policy, Armenia announced in December 2014, following negotiations with Russia, that it planned to extend the Metsamor reactor until 2026 instead of closing it in 2016. However, estimates suggest that Armenia plans to phase out Russia and its technology after that date and aims to build a new nuclear power plant with "an additional investment of $150 million" with the help of the West. Over time, Armenia's nuclear projects and the extension of Metsamor's previously planned operational life reflect the desire to develop a new plant. The International Atomic Energy Agency (IAEA) has also recognized this strategy, stating that "The lifetime extension of Unit 2 is one of the main priorities of the Government of the Republic of Armenia. If safe operation after 2026 is substantiated as a result of relevant studies, the Government of the Republic of Armenia intends to operate Unit 2 at least until 2036" (IAEA 2021). This decision means that the ecological problems caused by the Metsamor reactor will continue, particularly the release of nuclear waste water used to cool the reactor into the Aras River. The Aras River flows along the Azerbaijan-Iran border before merging with the Kura River and eventually reaching the Caspian Sea (Babayev 2012, 234; Ozdasli 2016, 51-52). As a result, the environmental consequences will not be limited to the immediate vicinity of Metsamor in Armenia, but will affect all countries along the Aras River, where radioactive waste is discharged, and the wider region extending to the Caspian Sea.

Thus, we see that the Metsamor radioactive waste will not only affect Türkiye on its eastern border and Azerbaijan and Iran on both sides of the river, but will also adversely affect the five Caspian Sea littoral states (i.e. Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan) in various ways. Whatever the reasons, these changes will affect all five Caspian states, with the most immediate impacts expected in Azerbaijan and Iran due to wastewater and possible radioactive leakage to Türkiye. The Iranian population living around the Aras River has suffered for years from rising cancer cases due to the use of the river for drinking water and agriculture. Nuclear waste has been ignored for political reasons, including years of protests by this community and even Iran's support for the Armenian government against Azerbaijan. Finally, after the "One Day Karabakh Operation" on September 19, 2023 and the liberation

of all occupied territories, Iran decided to play the Azerbaijani card. In an agreement with the Armenian side, it was agreed that Armenia would clean the river for a year in 2024 and clean up the nuclear waste dumped into the river (Tehran Times Staffs 2023; Nour News Staffs 2023).

It should be recognized that Metsamor's struggle is not limited to the current environment and possible radioactive leaks. In addition, Armenia has a security problem related to the operation of the plant and the needed fuel. The fact that the Metsamor plant is operated by the Russians and not by Armenia, and that the fuel brought from Russia is illegally removed from the plant and sold on the black market, raises the question of international nuclear security (Borger 2010; Nanagulyan et al. 2020). But this incident also raises many questions. For example, according to a report published in The Guardian on March 11, 2010, 18 grams of smuggled enriched uranium were hidden in a lead-lined cigarette packet belonging to two Armenians in Georgia. Interestingly, the enrichment level of this uranium is 89.4 percent. In an electricity-generating nuclear power plant, uranium is typically enriched to levels ranging from 3% to 5% U-235, which is sufficient for civilian power generation and does not require higher levels of enrichment (Center for Arms Control and Non-Proliferation 2021; Ferreira 2024). The main justification for enriching uranium beyond this threshold lies in the specific requirements for nuclear weapons, where a higher concentration of U-235 is needed for weapons production. Illegal diversion or unethical procurement of fuel for peaceful nuclear purposes, as in the case of the two Armenian citizens, could significantly alter the security dynamics and legal framework of the region and pose significant risks to both regional stability and international non-proliferation efforts.

This issue also serves as a proof that Armenia are treated more equally in international law and international relations. In recent years, the US and the EU have daily threatened MENA countries to build Nuclear Power Plants and Nuclear Facilities in Libya, Syria and Iraq have been bombed and destroyed by Israel (Brands and Palkki 2011, 156; Wertman 2022; Makovsky 2012; Squassoni and Feickert 2004, 5). At the same time, when Iran's nuclear activities were first revealed in 2003, it was subjected to threats, bombings, embargoes and maximum pressure. But 20 years later, it was officially announced and confirmed by IAEA experts that Iran would increase its uranium enrichment to 60% by 2023 (Murphy 2023). While the West and Israel bombed Libya, Syria and Iraq, which did not follow their policies, the UAE and the Saudis built US-approved power plants (Solomon 2023; Kaufman 2023; Mason 2020; Deen 2023). Iran was somewhere in the middle of these two groups. Its

facilities were neither bombed nor officially allowed to enrich. But only after the agreement in 2015, Iran had the right to enrich its nuclear fuel to about 3.67. The agreement was canceled by the US and sanctions returned, and according to recent reports, Iran has spent $400 billion to circumvent Western sanctions, a figure that was unofficially revealed by the former minister (Radio Farda Staffs 1400/2021). The West constantly exerts pressure by making various claims against states that do not align with its strategic interests. However, it is largely indifferent to cases like that of Armenia, where Russia supplies enriched uranium to the Metsamor Nuclear Power Plant, an old facility operating without adequate safeguards or regulatory oversight in accordance with standards set by experts from the European Union and the United States, that take Metsamor among the "most dangerous" nuclear plants still in operation (Mersom 2019; Shaffer 2021; According to Lavelle and Garthwaite 2011; Rzayeva 2022, 43–45). Paradoxically, this enriched uranium with the potential to produce nuclear weapons is not only inadequately safeguarded, but is also accessible to ordinary Armenian citizens, often smuggled and as discussed earlier, illegally traded on the black market. It is clear how different and double standards the West applies to Arabs, Iranians and Armenians in the same region.

A third problem specific to Azerbaijan's tasks, in addition to concerns about radioactive leaks and illicit trafficking of highly enriched nuclear materials, is evident in reports that Armenians have left and buried nuclear waste in the Karabakh region, which they have occupied for 27 years (Aras 2008,166). Except for the years 1989-1995, when the Metsamor Power Plant had to be shut down due to damage, the wastes of this power plant were transported to the Caspian Sea via the Aras River, and therefore our discussions on environmental problems only reflected the radioactivity leaks and the wastes dumped into the Aras River.

The decontamination of waste from the Metsamor Power Plant was not limited to the operation of the Metsamor Power Plant. However, as Jabbarli, Ozdasli and Ogan note in their research, there are also allegations that nuclear waste was dumped and buried in Karabakh during the years of Armenian occupation. Therefore, Azerbaijan's problems will not be limited to the Aras River and the Caspian Sea but will also have to face this problem in its own territory, because it is a fact that after the liberation of the occupied territories, it faces a hidden underground danger, the threat that poses a risk to the Azerbaijanis dwelling within it. Those who have emigrated from their homeland for many years, those who have returned to their homeland, and the modern agricultural

towns and cities that have been planned for many years and the agricultural products produced in them (Jabbarli 2003, 245). This situation increases the risk that the ongoing radioactive leaks from Metsamor will continue to pose a danger to Azerbaijan and the Caspian Sea and affect the entire region.

At the same time, the waste buried in Karabakh poses a threat to Azerbaijan and proves Armenia's anti-environmental activities. In the face of this threat to the environmental security of the 21st country, Türkiye and Azerbaijan constantly raise the issue in the international arena. Throughout the century, both Türkiye and Azerbaijan, as well as global actors, have repeatedly stated that the Metsamor Plant poses a regional threat in their meetings with the Secretary General of the International Atomic Energy Agency and other international organizations.

From a scientific point of view, radioactive leaks from Metsamor cannot be detected by instruments in the region, as the AIEA claims, but locals in eastern Türkiye and northwestern Iran are concerned about an increase in cancer and birth defects among humans and animals. (Ogan 2007; Mehrnami 2023; Chalabi 2023). However, another interesting aspect of Armenia's Metsamor plant is that, even considering the year it was built in the context of Soviet borders, its proximity to the borders of Türkiye and Iran signals a strategic rapprochement with these two neighboring countries. Today, the plant is located geographically far from Armenia's capital, but close to neighboring countries. The oldest and most dangerous Metsamor nuclear reactor poses a significant threat directly to Azerbaijan, Iran and Türkiye, primarily because of the risk of accidents. Geographically located in a mountainous and windy region and having suffered new earthquakes and damage in the last 35 years, Metsamor radioactive leaks from the plant spread into the environment even in the absence of an explosion. As mentioned earlier, this problem is exacerbated by Armenia's dumping of nuclear waste into the Aras River. This puts the three neighboring countries in a very dangerous situation, even in the absence of a major accident. There is therefore an urgent need for these countries to raise greater awareness of the dangers inherent in Metsamor, emphasizing not only its existence but also the potential risks it poses.

For political and economic reasons, Iran and Russia declined to comment, while international objections from Azerbaijan and Türkiye were portrayed by some as coming from opposing states. However, the IAEA rejected Azerbaijan and Türkiye's requests for an investigation, emphasizing that the nuclear waste was buried in Azerbaijan's occupied territories and discharged into the

Aras River, that radioactive leaks cause cancer and that the plant should be shut down (Armenpress Staffs 2023). In 2016, the European Union initiated a peer-reviewed stress test to analyze the safety capability of Metsamor. The test revealed that the plant's design related to seismic activities have deteriorated over time. The report also emphasized that there are no plans for nuclear waste leakage from the spent fuel compartments used for the interim storage of nuclear waste (EU Peer Review Report 2016). On the one hand, Tomczyk argues the EU's claim that Metsamor should be shut down due to decades of radioactive leaks (2019). On the other hand, Armenia's claim in late 2023 that there are no problems at the Metsamor Power Plant and that everything is under control reinforces its assertive stance on the nuclear power plant. Armenian policy makers and even the head of the Armenian government's Nuclear Safety Committee Khachatur Khachikyan stated that "there are no grounds to shut down the plant [...] The Metsamor NPP's current safety level is sufficient for it to operate safely," but none of these claims diminish the dangers that Armenia's Metsamor NPP poses to the region every day.

## Conclusion

In nuclear energy projects resulting from necessity, comprehensive technical studies have generally been lacking, and political decisions have taken precedence over geographical concerns. Many such plants, built in earthquake zones, or in unsuitable locations or with cost-cutting flaws, have led to disasters - Chernobyl being the most notorious. Armenia's Metsamor Power Plant is another example.

The Metsamor Power Plant was damaged in the 1988 Spitak earthquake, about 107 kilometers away, and was shut down the same year due to concerns of "seismic danger". Despite advances in nuclear technology, even the Fukushima Nuclear Power Plant in Japan suffered radiation leakage after the 2011 earthquake, underscoring the risks associated with seismic activities. However, the Metsamor Plant was later reopened due to Armenia's energy crisis during the First Karabakh War.

The Metsamor was built using old Soviet Union nuclear technology and is still under Russian maintenance. The Plant is located in a region with no major rivers and in critical need of water resources. It has been a constant source of ecological concern since its restart. The plant, which continues to operate despite multiple repairs, discharges its waste into the Aras River, which in turn

flows into the Caspian Sea, posing a significant environmental threat to the entire region.

Originally planned to be shut down between 2014 and 2017, Metsamor's lifespan was extended by Russia until 2026. However, since 40% of Armenia's electricity comes from this plant, Metsamor cannot be shut down so easily, despite all the criticism. Thus, in December 2023 Armenia announced further repairs to keep it running until 2036. This means that by 2036, if Armenia builds another nuclear power plant with the help of the US or France, if Russia allows another country to build a nuclear power plant, or if Metsamor is not destroyed by an explosion in the next 13 years, we can talk about shutting down Metsamor. Although the IAEA declared the plant stable in September 2023, an unforeseen earthquake or explosion could render the South Caucasus, Eastern Türkiye and Northwest Iran uninhabitable. Meanwhile, Iran and Russia have remained silent on the dangers of Metsamor due to their strategic and economic interests, while Azerbaijan has suffered from nuclear waste dumping for decades.

Although Azerbaijan and Türkiye have addressed the pollution of Metsamor's Aras River and brought it to international attention, it has been in question for years. Pollution from Metsamor, along with toxic waste from Armenia's mining industry, continues to contaminate the Aras River, causing serious health problems in Iranian border villages too. In addition to nuclear pollution, the process of emptying the waste of Armenia's Agarak copper mine, gold and aluminum mines is also discharged into the Aras River. In the border villages of Iran's northwest and Araz neighborhood, these pollutants cause stomach, esophagus, and intestinal cancer. A joint plan should be devised to convince other neighbors to agree with. This regional and inter-regional cooperation should not only remain at the state level, but also bring together environmental organizations, human rights organizations, nature NGOs and others. Bringing these states and NGOs together will be one of the key activities to direct the attention of global institutions and environmental organizations to the existing and potential dangers of the Metsamor NPP. This will require a planned and strong public diplomacy.

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