

The French Dependence on Russian Fuel-Cycle Services After 2022 Fueling a Sovereignty Gap

Matteo Rollin-Dijkhuis

Political and Social Sciences Department, Università Bocconi, Milan, Italy.
Bachelor's Degree in International Politics and Government.

E-mail: matteorollin@gmail.com

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Abstract

This article examines the extent to which France has remained dependent on Russian-linked nuclear fuel-cycle services after 2022, why that dependence has persisted, and what it means for French strategic autonomy and the credibility of European Union sanctions on Russia. Although France is widely presented as Europe's flagship nuclear power and a model of energy sovereignty, its alleged autonomy relies on a country with which it has strained relations. The analysis shows that dependence is not spread evenly across the entire nuclear sector, but is concentrated in specific and strategically important stages of the fuel cycle, especially conversion, enrichment, the management of reprocessed uranium, and parts of the associated logistical and contractual infrastructure. This reliance has continued due to structural constraints such as limited non-Russian processing capacity, long investment cycles, embedded commercial relationships, and the necessity of preserving electricity security. As a result, France continues to rely on Russian services, which weakens its own claims to strategic autonomy and undercuts the coherence of the wider EU sanctions regime. The degree of dependence is slowly shrinking, and the analysis suggests that a full and immediate rupture would be economically and politically risky. However, a phased exit is necessary and would require several measures. These goals include greater transparency, coordinated French and EU investment in fuel-cycle capacity, diversification of suppliers, and gradual trade restrictions. These measures would reduce Russian leverage without disrupting power generation. More broadly, the case demonstrates that the credibility of sanctions depends not only on political will, but also on the industrial capacity required to sustain it.

Keywords: France, Russia, Nuclear Power, Europe, Nuclear Fuel Cycle, Sanctions, Strategic Autonomy, Energy Security

1. Introduction

Nuclear power debuted in France in the early 1960s, and has since grown into a central pillar of the national energy model.¹ Today, France is known as Europe's

flagship nuclear power, a state whose reactor fleet supports both domestic electricity supply and broader claims to European energy sovereignty. Yet that sovereignty remains incomplete. The process of enriching nuclear material for power generation includes certain steps such as the conversion of reprocessed uranium, the re-enrichment of recycled uranium, and parts of the enriched-uranium

¹ International Atomic Energy Agency, "Country Nuclear Power Profiles: France," accessed April 22, 2026, <https://cnpp.iaea.org/public/countries/FR/profile/highlights>.

supply chain, all three of which are currently assisted by Russian companies.² Despite Paris's support for sanctions on Russia after the invasion of Ukraine, particularly on oil and gas, key stages of the nuclear fuel cycle have continued to depend, directly or indirectly, on Russian-linked services.

This dependence on Russian-linked services for nuclear fuel management is not purely a moment of hypocrisy by the French government. Rather, it demonstrates that this political-economic structure matters both within France and at the broader European level. France's 57 active reactors constitute a weak point for French strategic autonomy and energy security.³ This crisis could be exacerbated if the Russian state decides to ban all assistance in these nuclear services to Europe, and could put heavy strain on the French power grid if the situation persists.⁴ Over time, the European Union may lose credibility regarding its sanctions and this could cause a broader debate on exceptions in its sanctions policy.⁵ The EU has

sanctioned Russian oil and gas exports, practically ended imports from the state to reduce cash flow that could continue to fund the war in Ukraine, and yet still relies on and pays Russian companies for nuclear processing.⁶

This status quo is not a necessity, however. The situation can change, and even industries such as nuclear power that carry heavy momentum can change course. To change course, it is necessary to understand the depth of the current situation and establish the extent to which France remains dependent on Russian-linked nuclear fuel-cycle services after 2022, why that dependence has persisted, and what it means for French and EU sanctions credibility. This question is difficult to answer, as much of the data and process is partly obscured by fragmented trade data, technical reporting, and limited transparency in government and industry documents.⁷

However, the analysis shows a clear point. France continues to rely on Russian-linked nuclear services not because of simple ideological inconsistency, but rather out of necessity due to structural bottlenecks in conversion, enrichment, recycling, and long-term supply arrangements. Nevertheless, this dependence weakens the government's claims to strategic autonomy and undercuts the political

² Joana Lehner and Nicolas Camut, "France Enlists a Russian State-Owned Company to Help Make Nuclear Fuel in Germany," *Politico Europe*, December 22, 2025, <https://www.politico.eu/article/france-russian-state-owned-nuclear-germany-fuel/>.

³ "Nuclear Power in France," World Nuclear Association, last updated April 1, 2026, <https://world-nuclear.org/information-library/country-profiles/countries-a-f/france>.

⁴ "French Annual Electricity Review 2022: Key Findings," RTE, accessed May 6, 2026, <https://analysesetdonnees.rte-france.com/en/electricity-review-keyfindings>.

⁵ "Sanctions on Energy," European Commission, last updated April 23, 2026, https://commission.europa.eu/topics/eu-solidarity-ukraine/eu-sanctions-against-russia-following-invasion-ukraine/sanctions-energy_en.

⁶ Olena Lapenko, Ben McWilliams, Roman Nitsovych, and Georg Zachmann, "Ending European Union Imports of Russian Uranium," *Bruegel*, April 14, 2025, <https://www.bruegel.org/analysis/ending-european-union-imports-russian-uranium>.

⁷ Darya Dolzikova, "Catch-235: Western Dependence on Russian Nuclear Supplies Is Hard to Shake," *RUSI*, April 12, 2023, <https://www.rusi.org/explore-our-research/publications/commentary/catch-235-western-dependence-russian-nuclear-supplies-hard-shake>.

credibility of the European sanctions regime. To change this, France and the EU need to adopt a long-term option. A phased exit is possible, but only through coordinated investment, diversification, transparency, and gradual trade restrictions rather than abrupt disruption. This article first maps the relevant stages of the nuclear fuel cycle, then examines the evidence of continued dependence after 2022, before explaining the political and economic causes of continued reliance on Russian services and assessing the implications for French and EU policy.

2. Background

While France has been involved in nuclear research since the late 19th century, when Henri Becquerel discovered natural radioactivity and received the 1903 Nobel Prize in Physics, the French focus on nuclear power came much later, around the mid-20th century.^{8 9} France's nuclear development follows a state-centric model of industrial policy and strategic self-reliance.

The shift to nuclear power came after the oil shocks of the 1970s, when lawmakers realized that imported hydrocarbons were a structural vulnerability. To resolve this, they backed a large and standardized reactor fleet.¹⁰ That legacy still shapes how France speaks about sovereignty today, as a guarantee of independence. In

France, nuclear power is presented not only as low-carbon electricity but also as a guarantor of national resilience and a stabilizing asset for Europe. In practice, however, the autonomy promised by the French nuclear model is only partial, because the broader fuel cycle still depends on globally distributed and politically exposed services.

2.1 French Nuclear Model

Following the French system of industrial planning, power across the country is managed by the 'Électricité de France' (EDF), which operates 57 reactors across 19 plants.¹¹ Created as a public industrial and commercial establishment in 1946, EDF was converted into a public limited company by the 2004 reform.¹² After the French state repurchased the remaining shares in 2023, EDF returned to full state ownership and now operates as an integrated energy company governed by a Board of Directors. In 2021, issues with reactor corrosion and maintenance became a national crisis which brought many reactors offline for maintenance, and France had to import power in 2022 for the first time in over 40 years. Since the crisis, reactors have been repaired and power levels have recovered.¹³ In 2025, 69% of electricity in France was generated by nuclear power, and France exported 92.3 TWh, the highest annual electricity exports in its history.¹⁴

⁸ "Henri Becquerel - Biographical," Nobel Prize Outreach AB, accessed April 22, 2026, <https://www.nobelprize.org/prizes/physics/1903/becquerel/biographical/>.

⁹ "First Nuclear Power Stations Supplying Civil Energy," Citéco, accessed April 22, 2026, <https://www.citeco.fr/10000-years-history-economics/contemporary-world/first-nuclear-power-stations-supplying-civil-energy>.

¹⁰ World Nuclear Association, "Nuclear Power in France."

¹¹ World Nuclear Association, "Nuclear Power in France."

¹² "Electricité de France History," FundingUniverse, accessed April 22, 2026, <https://www.fundinguniverse.com/company-histories/electricite-de-france-history/>.

¹³ "2025 Annual Results," Électricité de France, February 20, 2026, <https://www.edf.fr/en/2025-annual-results>.

¹⁴ "France," Ember, last updated April 10, 2025, <https://ember-energy.org/countries-and-regions/france/>.

¹⁵ This is why nuclear power in France is not treated as just one technology among others. It is tied to the national belief in energy security and freedom from external pressure.

This domestic capability also strengthens the broader European role that Paris seeks to assume. Because of the large number of reactors, the French grid is not only a national asset but also part of the wider European balancing mechanism. This matters politically, as Paris can plausibly argue that its nuclear fleet contributes to European decarbonization and supply security, which strengthens French claims to leadership on energy policy. However, it also means that vulnerabilities within the French nuclear sector can spill outward. A disruption in fuel-cycle services is therefore not just a French problem, but can also become a European one.

2.2 The nuclear fuel cycle

The specific vulnerability in this analysis becomes clearer once the fuel cycle is unpacked. The nuclear fuel cycle begins with uranium sourcing, conversion, enrichment, and fuel fabrication.¹⁶ The fuel is then transported to and used by reactors, after which some material can also be reprocessed and partially recycled, and the rest is stored in long-term repositories. This partial

recycling is why the industry often describes the process as a “cycle” rather than a straight line.

The first step requires obtaining natural uranium concentrate from mining and milling. The second stage is conversion, in which uranium concentrate is transformed into chemical forms suitable for enrichment in the case of power generation. The third step is enrichment, where the concentration of fissile uranium-235 is increased. The fourth is fuel fabrication, where enriched uranium is manufactured into fuel assemblies for reactor use.

While France has imported all of its uranium since the new millennium, it is not absent from the latter three steps. This national management of processes does not stop in the second half of the cycle either. Orano’s La Hague site reprocesses used fuel and recovers reusable materials, while recycled material can be turned into new fuel.

The Russian presence is concerning at specific stages of this process. The most sensitive are conversion and enrichment, where Russian capacity has remained globally important. All steps in this process are complicated and require significant investment in specialised machinery, so Europe cannot increase its processing capacity immediately or in the short term. The issue is even clearer in recycled uranium. Although France reprocesses spent fuel domestically, Orano sends recycled uranium to Rosatom’s

¹⁵ “BE 2025 - Principaux résultats [EN],” RTE, accessed April 22, 2026, <https://analysesetdonnees.rte-france.com/en/annual-review-2025/keyfindings>.

¹⁶ “Dossier: Nuclear Fuel Cycle,” Commissariat à l’énergie atomique et aux énergies alternatives, July 25, 2016, <https://www cea.fr/english/Pages/research-areas/nuclear-energy/nuclear-fuel-cycle.aspx>.

Seversk plant for conversion and re-enrichment.^{17 18} So even a country with a very capable nuclear industry still relies on Russian services.

2.3 Post-2022 sanctions context

This major market share of certain nuclear services helps explain the current odd situation after Russia's full-scale invasion of Ukraine in February 2022. The EU moved far more aggressively against other Russian energy sources compared to its approach towards nuclear energy. Russian coal was banned. Russian oil faced import bans, price-cap measures, and restrictions on shipping and services. Gas was progressively squeezed through storage rules, infrastructure restrictions, transaction bans, as well as a change in the supply routes supported by the Biden administration at the time.¹⁹

Nuclear, on the other hand, remained practically untouched. The European Commission's own sanctions summary notes that some energy measures preserved limited exceptions for civil nuclear energy.²⁰ This indicates that the choices weren't just an oversight; there was a clear political and technical point. Sanctioning nuclear fuel is harder than sanctioning oil or coal. The products of this

cycle are lower-volume and less visible than fossil fuels, and are deeply embedded in long-term industrial arrangements. Nuclear fuel is specifically fabricated for compatible reactor designs, and replacement conversion and enrichment capacity takes years to increase. Additionally, several EU member states remain dependent on Russian supplies or Russian-designed systems, particularly in Eastern Europe.

For France, reliance on Russian services presents a potential strategic contradiction. While Paris supports a hard line against Russian fossil energy, it remains tied, directly or indirectly, to Russian nuclear services, as it continues to rely on the latter. The problem is not merely hypocrisy, it is that French strategic autonomy in electricity generation rests on an industrial chain whose most politically sensitive stages are not fully sovereign.

3. Analysis

France's nuclear sector is often presented as strategically autonomous by news outlets and as critically dependent on Russia by various advocacy groups. Neither view is fully accurate, as dependence is concentrated in specific stages of the nuclear fuel cycle where the reliance is currently unavoidable. This section examines where dependence actually persists, why it has proven difficult to eliminate despite political support for sanctions, and what this contradiction means for French credibility, European strategic autonomy, and Russia's remaining leverage.

¹⁷ AFP-JJJI, "French Uranium Being Sent to Russia, Greenpeace Says," *The Japan Times*, November 17, 2025, <https://www.japantimes.co.jp/news/2025/11/17/world/politics/greenpeace-france-uranium-russia/>.

¹⁸ "En Pleine Invasion Globale Russe de l'Ukraine, la France Reprend les Exportations d'Uranium de Retraitement Vers la Russie," Greenpeace France, November 17, 2025, <https://www.greenpeace.fr/espace-presse/en-pleine-invasion-globale-russe-de-lukraine-la-france-reprend-les-exportations-duraniu-m-de-retraitement-vers-la-russie/>.

¹⁹ "Sanctions on Energy."

²⁰ "Sanctions on Energy."

3.1 Where French dependence actually exists

While it does depend on Russia for certain processes, France still retains major domestic capabilities. The primary challenge, however, lies elsewhere. Dependence persists where international supply chains remain concentrated and where Russian actors, particularly Rosatom and its subsidiaries, continue to hold a major market share.

3.1.1 Natural uranium and upstream sourcing

France imports its fresh uranium from a variety of sources in Africa, Asia, North America, and Oceania. Specifically, France bought 33.9% of its natural uranium from Canada, 24.25% from Kazakhstan, 15.63% from Russia, 10.54% from Australia, and 8.25% from Niger in 2024.^{21 22} However, the issue is often misstated as simply French direct imports from Russian territory. The dependence is more accurately defined by the global uranium production and ownership system. Mining interests, joint ventures, and commercial relationships still include Russian influence. This influence is more prevalent when extraction occurs in third countries but remains tied to Russian capital, transport routes, or trading networks. These ties are in long-term joint ventures and agreements,

which creates a more diffuse but still politically relevant form of dependency. An example of this is Kazakhstan, where Russian-linked firms are present in parts of the sourcing and mining structure. The more consequential vulnerability appears further down the fuel cycle, where conversion and enrichment capacity is more concentrated.

3.1.2 Conversion and enrichment

Conversion and enrichment are where Russian leverage has historically mattered most. Even states with strong domestic nuclear sectors are not autonomous if they lack sufficient capacity at any stage needed to turn uranium into usable reactor fuel. Both conversion and enrichment are steps that are technically specialised and capital-intensive. Russia has long held a dominant share of the global market. Rosatom's operational enrichment capacity in 2022 stood at 27.1 million SWU out of a global total of 61.5 million SWU, or roughly 44% of global capacity.²³ At the European level, Russian services still accounted for 22.37% of conversion deliveries to EU utilities and 23.55% of enrichment deliveries in 2024.²⁴ This is why utilities and fuel cycle companies may remain exposed even when they possess substantial capabilities in the next steps elsewhere. In France, national and allied capacity is insufficient, fully booked, or slower to expand, which means it still has to rely on Russian companies. Essentially, France cannot achieve independence with its current infrastructure, and

²¹ Perrine Mouterde and Adrien Pécourt, "France Is Still Trading Uranium with Russia, Nearly Four Years After Ukraine Invasion," *Le Monde*, January 28, 2026, https://www.lemonde.fr/en/economy/article/2026/01/28/france-is-still-trading-uranium-with-russia-nearly-four-years-after-ukraine-invasion_6749895_19.html.

²² "France-Russia: Radioactive Trafficking Continues," Greenpeace France, January 2026, <https://cdn.greenpeace.fr/site/uploads/2026/02/Greenpeace-investigation-France-Russia-radioactive-trafficking-continues-2026-EN.pdf>.

²³ "Key Operating Results of State Atomic Energy Corporation ROSATOM," Rosatom, 2022, https://report.rosatom.ru/go_eng/go_rosatom_eng_2022/rosatom_key_2022_eng.pdf.

²⁴ "Annual Report 2024," Euratom Supply Agency, 2025, <https://www.europarl.europa.eu/cmsdata/297623/ESA%20Annual%20Report%202024.pdf>.

should target its weak spots to grow its national independence. The recycling stage complicates this picture because domestic reprocessing does not necessarily remove exposure to foreign conversion and enrichment services.

3.1.3 Reprocessed uranium

Conventionally, it is assumed that recycling and reprocessing could reduce foreign dependence by reusing spent fuel. However, this can also cause a separate dependency problem as reprocessed uranium still requires conversion and enrichment before reuse. Thus, some of those services have historically involved Russian facilities. As a result, instead of enhancing autonomy, the process reintroduces exposure at a later stage.²⁵ Orano can re-enrich recycled uranium at its Georges Besse II enrichment plant, but does not have the equipment needed for the initial conversion phase. That is why they signed a contract with Rosatom in 2020 for 1,150 metric tons of recycled uranium to be converted and enriched in Russia.²⁶ Although that contract is no longer active, this demonstrates how France recreates dependence at a later stage of the cycle.

3.1.4 Logistics and contracting

The nuclear supply chain contains a wide range of ports, intermediaries, insurers, transport arrangements, and long-term commercial contracts. Many of those entities are Russian, which makes reducing reliance hard due to existing contractual obligations and the lack of alternatives, as only a limited number of firms can provide these specific services due to a myriad of factors including specific credentials. If a country is already bound by long-term agreements, breaking those ties becomes harder in practice. Dependence can therefore persist due to commercial inertia and logistical architecture even when there is a political ability to change course.²⁷

Altogether, these steps show that French dependence on Russia is real, but varies at different processes. It is not spread uniformly across all electricity production or nuclear sector stages; it is instead concentrated in specific chokepoints within the cycle and its commercial infrastructure. This is how France appears broadly independent in its process while still remaining reliant and unable to change in a number of strategically sensitive areas. Having identified where dependence persists, the next issue is why it has survived despite France's and the EU's broader sanctions posture.

3.2 Why this dependence continues

Russian-linked nuclear services have been relied on by France not solely because Paris has acted in bad faith, but primarily because the fuel cycle's structure renders disengagement slow and costly. Conversion capacity is

²⁵ Bellona, "Charting More Arctic Nuclear Wreckage and Giving Soviet Nuclear Fuel a French Twist: The New Nuclear Digest Is Out," February 12, 2026, <https://bellona.org/news/nuclear-issues/2026-02-charting-more-arctic-nuclear-wreckage-and-giving-soviet-nuclear-fuel-a-french-twist-the-new-nuclear-digest-is-out>.

²⁶ "Recycled Uranium for Low-Carbon Electricity," Orano, last updated January 25, 2022, <https://www.orano.group/en/unpacking-nuclear/recycled-uranium-an-energy-source-for-low-carbon-electricity>.

²⁷ "Annual Report 2024."

commercially available in only a small number of countries, primarily Canada, France, Russia, and the United States, while enrichment requires specialised infrastructure and regulatory approval.²⁸ Even when political will exists, there is no switch that can be flipped overnight. The problem is not merely that Russia occupies part of the market. Rather, it is that replacing Russian services requires rebuilding alternative capacity in a segment of the fuel cycle in which Western states have shown little interest over recent decades.

3.2.1 Current Industrial & Economic Limits

The industrial constraint helps explain why this dependency was maintained past the 2022 invasion of Ukraine. France, through Orano, retains important domestic capabilities, but even French and other Western alternatives still need time to expand. Orano started a major expansion of the Georges Besse II enrichment plant in 2023, which is scheduled for completion in 2028.²⁹ The project was backed by the European Investment Bank (EIB) in 2025 to reduce reliance on imported Russian enriched uranium.³⁰ Policymakers and firms recognize the strategic problem, but replacing the infrastructure in use

takes years to achieve. Dependence persists not because France lacks awareness, but because the available replacement infrastructure is not set to fill a gap from the sudden break with Russian services.

Economic processes only reinforce these bottlenecks. Nuclear energy carries a heavy momentum and operates through long planning cycles and contracts designed to avoid interruption in fuel services. Once a production site or a company is embedded in the process, the incentive is to continue using it, and only change in crises if a suitable substitute is available. Although short-term supply security appears stable, contractual coverage for uranium and enrichment services could decline after 2032 if Russian agreements are not renewed.³¹ However, more non-Russian capacity does not appear automatically through geopolitical outrage. It must be financed, contracted, and justified commercially. Russian services have therefore remained attractive not only because of price, but because they were already embedded in established structures.³²

3.2.2 National and Regional Politics

A further reason lies in the imperfect alignment between state rhetoric and industrial practice. No company can reorganize its fuel cycle as fast as a politician making declarations. Firms responsible for reactor operation and fuel management must prioritise continuity and technical compatibility, while the state also has to protect grid

²⁸ Lapenko et al., “Ending European Union Imports of Russian Uranium.”

²⁹ “Progress on Georges Besse 2 Plant Extension Project,” Orano, December 9, 2025, <https://www.orano.group/en/news/news-group/2025/december/progress-on-georges-besse-2-plant-extension-project>.

³⁰ “France: EIB and Orano Sign a Loan Agreement for €400 Million Relating to the Project to Extend the Georges Besse 2 Uranium Enrichment Plant,” European Investment Bank, March 10, 2025, <https://www.eib.org/en/press/all/2025-130-eib-and-orano-sign-a-loan-agreement-for-400-million-euros-relating-to-the-project-to-extend-the-georges-besse-2-uranium-enrichment-plant>.

³¹ “Annual Report 2024.”

³² Lapenko et al., “Ending European Union Imports of Russian Uranium.”

stability and avoid disruptions to electricity supply. The European Commission's own 2025 roadmap reflected this gap. Rather than demanding an immediate rupture, it called for a gradual removal of Russian oil, gas, and nuclear energy from EU markets in a "coordinated and secure manner," with member states preparing national plans and nuclear measures.³³

EU-level politics also make a sudden break more difficult. Sanctions policy requires coalition-building among member states.³⁴ These states have very different levels of exposure and preferences. The Commission's sanctions pages show extensive restrictions on Russian coal, oil, LNG, and energy investment. Nevertheless, they also note exceptions for civil nuclear energy in parts of the broader energy regime. Nuclear dependence is only a factor for some states in the Union, a smaller subgroup of which has Soviet-designed reactors and stronger direct reliance on Russian fuel services while others are less exposed and therefore more willing to press for tougher measures. Slovakia publicly stated that it would not agree to the Commission's 2025 plan to stop Russian gas, oil, and nuclear fuel supplies, describing it as contrary to its interests.³⁵

³³ "Roadmap to Fully End EU Dependency on Russian Energy," European Commission, May 6, 2025, https://commission.europa.eu/news-and-media/news/roadmap-fully-end-eu-dependency-russian-energy-2025-05-06_en.

³⁴ "How the EU Adopts and Reviews Sanctions," Council of the European Union, accessed May 6, 2026, <https://www.consilium.europa.eu/en/policies/sanctions-adoption-review-procedure/>.

³⁵ "Slovakia Disagrees with EU Plan to Stop Gas, Oil and Nuclear Fuel Imports from Russia," Ministry of Economy of the Slovak Republic, May 6, 2025,

Risk aversion, finally, ties all of these elements together. For governments, the reputational damage of continuing some trade of nuclear materials with Russia was real, but the supply disruption of breaking off was greater. Given France's substantial reliance on nuclear generation, policymakers had strong incentives to prioritise operational continuity over moral consistency. This does not absolve French policy of contradiction. It does, however, place that contradiction in its proper context. This behaviour is better understood alongside the industrial bottlenecks, commercial relationships, EU divergence, and caution over supply security. Dependency persists because the immediate costs of withdrawal exceed those of partial entanglement.

3.3 Implications

There are a range of national and regional implications of this continued use that push France and the EU to end this reliance. First, the continued use of Russian-linked nuclear services weakens the coherence of European sanctions. The EU has now adopted 19 sanction packages against Russia.³⁶ They are part of a strategy to sustain economic pressure against the war, yet the Commission only set out a roadmap for phasing out Russian nuclear energy in May 2025 and asked member states to prepare

<https://www.economy.gov.sk/en/press/slovakia-disagrees-with-eu-plan-to-stop-gas-oil-and-nuclear-fuel-imports-from-russia>.

³⁶ "19th Package of Sanctions against Russia: EU Targets Russian Energy, Third-Country Banks and Crypto Providers," Council of the European Union, October 23, 2025, <https://www.consilium.europa.eu/en/press/press-releases/2025/10/23/19th-package-of-sanctions-against-russia-eu-targets-russian-energy-third-country-banks-and-crypto-providers/>.

national phase-out plans by the end of that year.³⁷ Unlike oil, coal, or much of the gas trade, nuclear has remained a sector in which supply concerns have overridden the political logic of isolation.

There are complications for a French phase-out, however. Nuclear power is a pillar of sovereignty for France and a growing feature of the European autonomy agenda. It has even begun plans to build six new reactors. Yet autonomy in electricity generation is distinct from autonomy across the fuel cycle. New infrastructure is being built to increase autonomy, but results will not materialize for several years. France can claim that it is moving toward greater independence, but it cannot claim that such independence already exists.

These situations also demonstrate a wider EU problem. The Union is willing to preserve hardline rhetoric on some sectors like oil and gas while tolerating slower exit strategies in other sectors such as the nuclear sector. The Commission acknowledges the combination of factors that make a full cutoff unrealistic. It understands that conversion and enrichment are only done by a few companies, that EU capacity cannot yet meet its own demand, and that new enrichment installations are not expected before 2027 and new conversion facilities until

the 2030s.³⁸ In 2024, seven EU countries still imported enriched uranium or nuclear services from Russia.³⁹

This reliance on Russian services does not grant Russia heavy leverage on EU power, as alternative suppliers and nuclear reliance is diminishing. Additionally, political willingness to reduce exposure is now stronger than ever. But there is still some leverage that cannot be ignored. As long as Russia remains present in stages where no replacements can pick up the slack, it retains the ability to raise costs and create friction. While France faces significant constraints, its leadership in European strategic autonomy is complicated by the very power it seeks to contain in a particularly sensitive sector. This contradiction remains politically costly even as the dependency shrinks, and it will continue to weaken sanctions credibility.

4. Policy Recommendations

This reliance on Russia is not an insurmountable issue as long as France acts effectively to reach its goal. That means replacing passive exposure with an explicit transition strategy that cuts Russian leverage step by step while preserving power-system stability by building

³⁸ “Strategic Autonomy and the Future of Nuclear Energy in the EU: Use and Availability of High-Assay Low-Enriched Uranium and Its Potential Role in Securing a Clean, Safe Energy Supply,” European Parliamentary Research Service, February 2024, https://www.europarl.europa.eu/RegData/etudes/BRIE/2024/757796/EPRS_BRI%282024%29757796_EN.pdf.

³⁹ “Roadmap towards Ending Russian Energy Imports,” European Commission, May 6, 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0440R%2801%29>.

³⁷ “Roadmap to Fully End EU Dependency on Russian Energy.”

enough Western fuel-cycle capacity to make diversification durable.

4.1 Short-term measures

In the short term, French policy would benefit from prioritising transparency and managed transition. This could include clearer reporting requirements across the nuclear fuel cycle, particularly in relation to Russian-linked services and intermediaries. The French parliament could amend the Code de l'énergie to add a multi-level reporting system which would require EDF, Orano, and other relevant operators to disclose the origin of uranium, the location of conversion and enrichment services, the identity of intermediaries, the duration of contracts, and the extent of exposure to Russian entities. This reporting system could be managed by the Ministry for Energy which would implement the rules through decrees or ministerial orders, including reporting templates and confidentiality rules for commercially or national security sensitive data. Politically embarrassing dependence tends to survive when it remains obscured, and while transparency would not by itself end the problem, it would make continued reliance visible to Parliament, regulators, and the public, hindering firms from defending indefinite delays. This fits the broader EU direction, which now explicitly links phase-out policy to greater transparency over nuclear dependencies.⁴⁰

Another change that can be implemented now is phased quotas on all Russian nuclear services. A sudden prohibition poses both political and economic risks,

⁴⁰ "Roadmap to Fully End EU Dependency on Russian Energy."

whereas a quota system that decreases annually is more credible and practical. Paris could write national energy-security legislation to set ceilings on conversion, enrichment, and other related services linked to Russian firms, lowering them over a fixed timetable.⁴¹ This would prohibit new long-term contracts that extend dependence beyond the transition window. Temporary exemptions could be limited to narrowly defined electricity-security needs and made subject to public justification, rather than being treated as routine commercial exceptions. Euratom could implement a similar structure to encourage all states to begin prioritising the strengthening of this industry at a European level.⁴²

4.2 Medium-term measures

Over the medium term, the French priority should be to accelerate domestic and European capacity across the fuel cycle, in the stages where Russia is involved. Orano's Georges Besse II expansion already has EIB backing, with first productive operations planned for 2028 and full commissioning expected by 2030.⁴³ The EIB should expand this program and invest into more plant growth across the EU. Additionally, there should be an emphasis on Euratom financing mechanisms and loans to help states start these projects as the European Commission can issue Euratom bonds to finance projects on nuclear power generation and nuclear fuel-cycle projects.⁴⁴ At the

⁴¹ Lapenko et al., "Ending European Union Imports of Russian Uranium."

⁴² "Roadmap to Fully End EU Dependency on Russian Energy."

⁴³ "Progress on Georges Besse 2 Plant Extension Project."

⁴⁴ "Euratom," European Commission, accessed May 6, 2026, https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/euratom_en.

national level, France could support this process through faster permitting procedures and public financial guarantees where necessary, making additional non-Russian capacity more commercially viable.

France could also reinforce European alternatives in the remaining parts of the fuel cycle where Russian involvement continues to create strategic exposure. Here the state should provide R&D support and guaranteed demand commitments to prevent recycled uranium from becoming a conduit for persistent Russian dependence. The priority should be targeting conversion and enrichment as they are the primary bottlenecks, then focus on recycled uranium conversion, by having companies like Orano and EDF strengthen ties with firms such as Bilfinger to deliver plant upgrades, component manufacturing, and installation. Separately, Paris should also push for more research in High-Assay Low-Enriched Uranium (HALEU).⁴⁵ This technology can alleviate the construction costs, both financial and logistical, by allowing more nimble reactors. Investing in this technology now allows France to stay further ahead of the curve in nuclear power. Paris cannot accept autonomy in electricity generation while outsourcing the most politically sensitive parts of the cycle if it is serious about nuclear sovereignty.

This will help diversify supply partnerships with non-Russian producers and service providers and enable long-term contracts rather than spot purchases. This also

means French firms should try locking in more non-Russian enrichment and conversion services now, even if they are more expensive at the moment. The November 2025 enrichment agreement between Urenco and EDF serves as a model that France should build on across the entire fuel cycle.⁴⁶

4.3 EU-level measures

At the EU level, the main focus needs to be coordination. The Euratom Supply Agency (ESA) already maintains regular and equitable nuclear supply through a common policy.⁴⁷ That framework should be enhanced to enable coordinated procurement and contract monitoring.⁴⁸ This should also follow on to exposure reporting, and Euratom should publish annual EU-level reports on Russian-linked nuclear supply exposure, with confidential annexes where needed. Joint European financing should target structural vulnerabilities of the fuel cycle where Russian firms are involved, particularly regarding old Eastern European VVER reactors relying on Russian fuel types.

Trade measures should also be adopted to gradually shrink the Russian dependence without causing sudden disruptions. Measures like tariffs or quotas would be consistent with the Commission's own 2025 roadmap,

⁴⁵ "Strategic Autonomy and the Future of Nuclear Energy in the EU."

⁴⁶ "Urenco and EDF Sign Fuel Deal at World Nuclear Exhibition," Urenco, November 6, 2025, <https://www.urencocom/news/global/2025/urencocom-and-edf-sign-fuel-deal-at-world-nuclear-exhibition>.

⁴⁷ "Mission and Strategic Objective," Euratom Supply Agency, accessed May 6, 2026, https://euratom-supply.ec.europa.eu/index_en.

⁴⁸ "Annual Report 2024."

which explicitly favors a gradual and coordinated phase-out over shock therapy.⁴⁹ As long as Russian backed services remain a low-cost option, some firms will continue to rely on them.

4.4 Guardrails

An exit strategy must prioritise electricity security to avoid creating another dependency elsewhere that would be worse. A good phase-out will reduce Russian leverage without pushing France into reactor disruptions or price spikes, or, more critically, creating a new dependency on another state. For that reason, each reduction target should be tied to replacement capacity and minimum strategic inventories.⁵⁰ Where derogations are needed, they must fulfill certain requirements. They should be time-limited, to motivate states to adapt instead of postpone administratively. They must also be justified, with these justifications reviewed frequently.

5. Conclusion

This article aimed to understand the extent to which France remains dependent on Russian-linked nuclear fuel-cycle services after 2022, why that dependence has persisted and what it means for French and EU sanctions credibility. The results were clear. France is not broadly dependent on Russia across its entire nuclear sector. It does, however, remain dependent on several strategically important parts of the fuel cycle. In particular, Russian conversion, enrichment, recycled uranium processing, and supporting commercial infrastructure constitute strategic

vulnerabilities for French autonomy. The dependence has persisted not because Paris lacks awareness, but because alternative capacity cannot be built fast enough to replace Russian services without creating risks to electricity security.

The broader lesson of this case is that policies are only as strong as the industrial base supporting them. Political declarations can be adopted quickly, whereas fuel-cycle infrastructure requires long investment cycles and stable commercial demand. Strategic vulnerability remains where domestic or allied capacity is missing. In this sense, France's position is not merely a case of political inconsistency. It reflects the tension between strategic ambition and the material constraints of the nuclear fuel-cycle structure.

For Europe, the implication is that strategic autonomy cannot be reduced to political rhetoric. It requires control over the supply chains that underpin critical sectors, including nuclear energy. If the EU wants sanctions on Russia to remain credible and effective, it will need to invest in the industrial capabilities necessary to make independence feasible. Otherwise, Europe risks maintaining a gap between its stated commitment to autonomy and the dependencies that continue to shape its energy system.

⁴⁹ "Roadmap to Fully End EU Dependency on Russian Energy."

⁵⁰ "Annual Report 2024."

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