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SOCIOLOGY

OF SERBIA'S NUCLEAR RENAISSANCE:

SOCIETY, INSTITUTIONS, GOVERNANCE

Part 2. Institutional-Managerial Architecture and Behavioral Models of Stakeholders in the Development of Nuclear Energy

Content

Introduction

The comprehensive analysis of socio-behavioral models and reactions of Serbian society to the lifting of the 35-year nuclear moratorium, presented in the first part of this study, clearly demonstrated that the integration of nuclear energy faces profound socio-cultural challenges.[1] The Social Amplification of Risk Framework (SARF), entrenched technological stigmatization, and a pronounced local NIMBY ("Not In My Back Yard") syndrome form a complex and often hostile environment for implementing nuclear megaprojects.[1]

However, as the global experience of newcomer countries convincingly proves, obtaining a "social license to operate" is only a necessary, but far from sufficient, condition for success.

The fundamental and most destructive risks for nuclear energy development processes do not originate on the streets of potential host cities, but within the offices of the state apparatus.[2]

The successful transition from declarative political strategies to the commissioning of safe and economically efficient reactors crucially depends on the institutional architecture, as well as the motivation, qualifications, and hidden behavioral patterns of the managerial elite.[4]

For the Republic of Serbia, entering the practical implementation phase of the updated Energy Sector Development Strategy until 2040, it is critically important to realize that the state bureaucracy is not a monolithic mechanism that unquestioningly and efficiently pursues national interests.[1] On the contrary, it is a highly complex ecosystem of stakeholders, including relevant ministers and their deputies, working group members, functionaries of the Nuclear Energy Programme Implementing Organization (NEPIO), heads of independent oversight bodies, and representatives of local administrations.

Each of these actors operates within their own political cycles, departmental interests, financial incentives, and cognitive biases.[7] The extremely high capital intensity of nuclear projects, reaching tens of billions of euros, combined with unprecedented technological complexity and long implementation timelines (up to 15 years from planning to launch), creates unique information asymmetry.[9] This asymmetry forms an ideal breeding ground for bureaucratic paralysis, rent-seeking behavior, corrupt collusion, and destructive clan struggles, particularly in the geopolitical choice of an international vendor.[11]

This document, acting as a logical and structural continuation of the first part of the study, provides an exhaustive analysis of the institutional roles, behavioral models, motivational gaps, and qualification deficits of the elite groups involved in managing the development of nuclear energy. Drawing on advanced academic concepts of behavioral economics, political economy, and a detailed examination of precedents in countries with developing and advanced nuclear programs, this report aims to identify systemic vulnerabilities and propose strategic vectors to minimize the risks of administrative sabotage that could prove fatal to the country's energy sovereignty.

1. Role and Behavioral Models of Involved Actors: From the Political Elite to Local Bureaucracy

Analyzing the behavior of key decision-makers in nuclear energy development requires moving away from the classical rational choice paradigm. Modern behavioral economics research, particularly drawing on Daniel Kahneman and Amos Tversky's Prospect Theory, proves that officials and regulators systematically deviate from ideal rationality under the influence of emotions, cognitive biases, loss aversion, and institutional pressure.[7] These factors shape unique, often destructive behavioral models for each stratum of the managerial apparatus.

1.1. Top Political Leadership (Ministers, Deputy Ministers, State Secretaries)

The top political elite is characterized by a fundamental conflict between long-term national development goals and the short-term nature of electoral cycles. Nuclear megaprojects exhibit extreme temporal asymmetry: political risks, the need for colossal budgetary allocations, and social tension arise immediately, while macroeconomic dividends in the form of cheap baseload generation materialize beyond the term of the incumbent cabinet.[2]

As a result, the dominant behavioral model of this group becomes a **model of symbolic technocratism and short-term political capital maximization while avoiding irreversible decisions**.

Top officials willingly participate in drafting framework strategies, signing international memorandums of understanding (e.g., with France's EDF or Russia's Rosatom state corporation), and initiating interdepartmental commissions.[1] These actions generate a positive informational background, demonstrating commitment to decarbonization and technological progress goals. However, when the process reaches the stage of making binding financial commitments (Final Investment Decision) or providing sovereign state guarantees for billions of euros, ministers tend to exhibit an extreme degree of hedging.[18]

Prospect theory explains this by noting that in situations of potential "losses" (project failure, budget overruns), politicians become hypersensitive to political damage, preferring to shift the responsibility for the final choice of technology or vendor onto expert councils or international consortiums.[7]

This leads to the phenomenon of "paralysis by analysis," where instead of concrete contracting steps, new rounds of pre-investment studies are continuously initiated.

1.2. NEPIO Functionaries and Members of Nuclear Infrastructure Development Working Groups

According to the Milestones Approach developed by the International Atomic Energy Agency (IAEA), the key institution during a country's preparatory phase for a nuclear program is the Nuclear Energy Programme Implementing Organization (NEPIO), representing a consortium of officials from various ministries, experts, and lawyers.[17]

Members of these working structures are characterized by a **model of institutional survival and bureaucratic proliferation**.

In newcomer countries that have been under a moratorium for a long time (like Serbia), there is an acute deficit of "institutional muscle memory"—practical experience in implementing industrial megaprojects.[2] Recognizing their own vulnerability and massive information asymmetry compared to experienced foreign vendors, working group members form a "defensive rationality" model. This manifests in a desire to stretch out the preparatory phases (Phase 1 and Phase 2 according to the IAEA classification) for as long as possible.[17]

Officials continuously commission redundant studies from international consultants, expand the staff of project offices, and create complex, multi-level approval regulations.[16] The motive is not so much sabotage as an attempt to dilute personal responsibility for potential future failures (cost overruns or technological defects).[9]

Working groups can spend years detailing site selection criteria or environmental parameters, turning the preparatory process into a self-sufficient, continuously funded industry that never leads to the pouring of the first concrete.

1.3. Heads and Employees of Independent Oversight Bodies (Regulators)

Regulatory bodies in the field of radiation and nuclear safety represent the most complex element of the managerial architecture. International standards (particularly the Convention on Nuclear Safety and IAEA standards) categorically demand the complete independence of the regulator from organizations involved in promoting nuclear energy.[4]

Behavioral economics reveals the dominance of a restrictive model (extreme risk aversion) among regulatory representatives.

Unlike ministries of economy, the regulator receives no political dividends or bonuses for the fast, cost-effective licensing of a reactor or adherence to construction schedules.[24] On the contrary, in the event of any incident, the regulator will bear criminal and historical responsibility. As an analysis of the US Nuclear Regulatory Commission (NRC) shows, the institutional architecture of oversight bodies is historically built exclusively around a single parameter—absolute safety, without regard to the macroeconomic needs of society or climate imperatives.[24]

In newcomer countries, this phenomenon is exacerbated. Wanting to prove its independence to society (and international observers), the national regulator may succumb to institutional jealousy, deliberately blocking initiatives from relevant ministries.[4] The licensing process turns into a search for hypothetical threats: the regulator may continuously revise requirements for seismic resistance, hydraulic calculations, or subcontractor supply chains, demanding absolute, unattainable perfection (the "gold-plating" effect). Such bureaucratic caution, while dictated by good intentions, paradoxically becomes the main obstacle to deploying innovative technologies, such as Small Modular Reactors (SMRs), because regulators attempt to apply outdated, cumbersome regulations designed for massive, older-generation pressurized water

reactors to them.[5]

1.4. Local Administrations of Potential Host Sites

The role of municipal heads and local bureaucracy in territories considered for hosting nuclear facilities fundamentally differs from the national level. Their behavior fits into a **transactional model of local opportunism and rent extraction**.[1]

For the mayor of a potential host community, abstract concepts of national energy independence are secondary to the local budget. Administrations view a nuclear project as an unprecedented source of investment, tax deductions, and compensation payments through Community Benefit Agreements (CBAs).[1]

The behavioral paradox is that local elites may implicitly encourage environmental protests and the NIMBY syndrome among the population, using public dissatisfaction as leverage in negotiations with the central government and the investor.[26] By threatening to withhold local land-use permits (zoning laws) or water intake approvals, municipalities bargain for a multiple increase in investments for local schools, hospitals, and roads, as well as preferences for affiliated local businesses in subcontracting construction work.[1]

Management Stratum	Key Actors	Dominant Behavioral Model	Attitude to Risks and Responsibility	Impact Vector on the Nuclear Project
Macro-level	Ministers, political appointees	Symbolic technocratism, political capital hedging [15]	Avoidance of financial responsibility, shifting decisions to international structures [7]	Project initiation, but a tendency to freeze at the financing stage.[19]
Meso-level (Strategy)	NEPIO management, project offices	Institutional survival, bureaucratic proliferation [16]	Transfer of risks to foreign consultants, dilution of personal responsibility [9]	Artificial prolongation of preparatory stages, endless planning.[20]
Meso-level (Oversight)	Inspectors and heads of the Regulator	Restrictive model, extreme risk aversion [13]	Absolute risk intolerance; ignoring economic consequences of delays [24]	Inflating requirements (gold-plating), blocking innovations due to

Management Stratum	Key Actors	Dominant Behavioral Model	Attitude to Risks and Responsibility	Impact Vector on the Nuclear Project
				outdated norms.[24]
Micro-level	Mayors, municipal councils	Transactional opportunism, local rent extraction [6]	Instrumentalization of local risks (NIMBY) for political bargaining [26]	Blackmailing the investor by delaying land and infrastructure approvals.[29]

2. Motivation, Efficiency, and the Nature of Administrative Obstacles

The question of how efficiently management structures can and want to work within a nuclear program is central to understanding the viability of initiatives in newcomer countries. Empirical data, including the experience of Eastern European and developing nations, highlight a profound gap between declarative political will and the actual operational efficiency of the apparatus.[2]

2.1. The Illusion of Consensus and the Deficit of Executive Motivation

The phenomenon, described in academic literature as the "sovereign signal," underscores that the state elite can demonstrate almost universal rhetorical support for nuclear energy. Governments allocate funding, pass laws (like the amendments to the energy law in Serbia [1]), and stimulate the creation of dozens of conceptual designs. Nevertheless, empirical experience (especially in Western democracies) demonstrates a striking inability to bring these plans to completion.[2]

"We have consensus. We do not have construction," analysts summarize the paradox of modern nuclear policies.[2]

Officials *want* to work on the nuclear program only insofar as it provides them access to prestige, international business trips (IAEA missions, exhibitions, negotiations with vendors), and administrative weight.[16] However, as soon as the process moves into the routine, extremely complex phase of harmonizing thousands of regulatory acts, motivation drops sharply. Effective work requires colossal intellectual effort, making unpopular tariff decisions, and being ready to take responsibility for potential failures decades ahead—incentives that are practically absent in a civil servant's standard KPI system.[5]

2.2. Unintentional Obstacles: Structural Fragmentation and the "Silo" Effect

A significant portion of administrative barriers arises unintentionally due to the systemic inadequacy of the apparatus for the scale of the task.[3] A nuclear project requires unprecedented synchronization: the

Ministry of Education must prepare hundreds of physicists by the station's launch, the Ministry of Infrastructure must provide reinforced transport routes to deliver extra-heavy equipment (reactor vessels), and the Ministry of Finance must structure credit lines.[4]

In practice, state structures operate in isolated "silos". The lack of cross-functional coordination leads to structural delays. For instance, a regulator might spend years developing a licensing base while the energy ministry is already announcing construction tenders, creating a legal vacuum and uncertainty for investors.[4] Furthermore, multi-year pauses in construction (as in Serbia due to the moratorium) have resulted in the loss of the industry's "muscle memory."[3] The loss of generational continuity among engineers and managers means that new officials are forced to reinvent the wheel, making critical errors in evaluating project documentation and managing risks.[3]

2.3. Intentional Obstacles: The Hold-up Problem and Bureaucratic Blackmail

Alongside incompetence, nuclear projects face intentional obstacles. The classic microeconomic issue of incomplete contracts and the "hold-up problem" manifests here on a hypertrophied scale.[28] As soon as an investor (whether the state budget or a foreign vendor) sinks the first hundreds of millions into survey work and site preparation, these investments become sunk costs.[22]

Realizing that the investor can no longer abandon the project without catastrophic losses, relevant departments, environmental inspectorates, and local authorities gain tremendous bargaining power.[29] They begin to deliberately delay the issuance of warrants, demanding additional concessions: revision of environmental fees, inclusion of unnecessary infrastructure facilities in the budget, or employment of affiliated persons.[6] The investor becomes a hostage to the bureaucracy, forcing them either to make corrupt compromises or freeze construction.[9]

Another type of intentional obstacle is institutional sabotage. In politically polarized systems, individual officials who disagree with the vendor choice (for example, due to geopolitical sympathies toward the West or the East) can use procedural tools to block the project.[3] They can endlessly stretch the timelines for Environmental Impact Assessments or initiate new rounds of public hearings, formally complying with the law while effectively destroying the project's implementation schedule.[2]

3. Chronology of Delays: From Schedule Shifts to Fatal Risks of Bureaucratization

Can the risks of bureaucratization become fatal for nuclear energy development processes? The international experience of recent decades gives a categorically affirmative answer: **administrative paralysis and the inefficiency of oversight bodies are the primary causes of the financial collapse of most Western nuclear initiatives.** [3]

3.1. The Mechanics of Debt Collapse

The financial structure of a nuclear power plant radically differs from fossil fuel or renewable energy

projects. Capital expenditures (CAPEX) and Interest During Construction account for 60% to 80% of the Levelized Cost of Energy (LCOE).[10] With the construction cost of a modern Generation III+ reactor ranging from $8 to $15 billion [10], every year of delay results in hundreds of millions of euros in accrued loan interest, unbacked by revenue. If the delay extends to 5-7 years, the project's financial model collapses irreversibly, and the station loses its market profitability for the remainder of its lifecycle.[19]

3.2. Global Statistics of Bureaucratic and Managerial Failures

Modern history abounds with examples of how bureaucratic and managerial inefficiency led to catastrophic schedule shifts:

- **USA (Vogtle and Watts Bar Precedents):** The revival of nuclear energy in the US exposed critical vulnerabilities. The Vogtle-3 and 4 project (Georgia), despite its successful completion in 2023-2024, was delivered with a seven-year delay, and its final budget was two and a half times the original estimate.[3] The cause was starting construction before finalizing the basic design and endless changes in requirements from the NRC regulator. Even more indicative is the story of the Watts Bar 2 power unit, whose construction, interrupted by bureaucratic and financial disputes, dragged on for an unprecedented 43 years (from 1973 to 2016).[10]
- **France (Flamanville-3 Project):** The French EPR reactor was built under constant revision of safety standards by the oversight body (ASN). The inability of subcontractors to ensure the required quality of welds and the bureaucratic procedures for certifying them led to the project being implemented with a 12-year delay and a threefold budget overrun.[3] This dealt a massive blow to the reputation of the entire European nuclear industry and led to the de facto bankruptcy of the Areva corporation, requiring a state bailout.[3]
- **Experience of Newcomer Countries (UAE - Barakah Project):** Although the Emirati program is recognized as one of the most successful in history [1], it also did not escape delays imported from the vendor country (South Korea). Due to a scandal involving forged safety certificates for cables (detailed in Section 5), the launch of the UAE reactors was postponed by almost three years because the Emirati regulator (FANR) was forced to rigorously audit all components anew to verify their reliability following the failure of the Korean bureaucracy.[34]

3.3. The Fatal Risk: Abandonment

The most dangerous consequence of bureaucratization is the scenario of complete collapse—abandonment. Global practice has recorded over 50 cases where projects were halted during the construction phase.[33] A classic example is the disaster of the V.C. Summer project (Units 2 and 3) in South Carolina, USA. Faced with technological difficulties, contractor incompetence, and shifting regulatory requirements, the project began to fall hopelessly behind schedule.[33] Instead of openly engaging with oversight bodies and seeking systemic solutions, the company's management (SCANA) resorted to fraud, hiding the scale of delays and cost overruns from shareholders and the state.[36] Ultimately, after absorbing billions of dollars, the project was deemed economically unviable and completely abandoned.[33] Top

executives of the corporation (Kevin Marsh and Stephen Byrne) were convicted and sentenced to prison for fraud.[36] For an economy like Serbia's, such a scenario—investing billions of euros in borrowed funds into an unfinished concrete shell amid bureaucratic wars—would mean a sovereign default and a collapse of trust in the government.[1]

4. Qualification Requirements and Competency Architecture: IAEA Standards

Recognizing that the primary factor in the failure of nuclear initiatives is the degradation of human capital at the managerial level, the international community and specialized institutions (IAEA) have developed strict qualification frameworks (Nuclear Infrastructure Competency Framework) for countries entering the nuclear club.[37]

The fundamental paradigm shift is that successfully managing a national nuclear program requires not just deep knowledge of nuclear physics or engineering, but outstanding competencies in systemic management, macroeconomics, and behavioral psychology.[32] To prevent institutional collapse, the following qualification imperatives must be applied to individuals appointed to key posts in NEPIO, ministries, and oversight bodies.[41]

4.1. Competencies of Top and Middle Management (NEPIO and Relevant Ministries)

Managers responsible for the project's strategic deployment must be evaluated through the lens of the IAEA standard GSR Part 2 (Leadership and Management for Safety) and specialized Nuclear Leadership Programmes (NLP).[40] Key requirements include:

1. **Systemic thinking:** Candidates must demonstrate the ability to see the complex interconnections between technical solutions, personnel behavior, and organizational structures.[40] A manager must understand how a delay in issuing a water use permit by a local administration will affect an EPC contractor's logistics and sovereign bond repayment schedules.
2. **Emotional intelligence and self-awareness:** The ability to make balanced decisions under colossal pressure, maintaining empathy and clarity of thought during crises.[40]
3. **Safety culture and change management:** Leaders must understand that a safety culture is not imposed by directive. A leader must have the skills to foster a psychologically safe environment where engineers and workers are not afraid to report defects and violations (whistleblowing) for fear of punishment.[40] The experience of failures like V.C. Summer proves that a culture of silencing problems by top management leads to financial and technological disaster.[36]
4. **Stakeholder engagement:** The ability to articulate project goals in a language understandable to various segments of society. Officials must abandon technocratic arrogance and be able to engage in dialogue within the framework of an "ethics of care," addressing the concerns of women, youth, and rural populations.[1]

4.2. Personnel Requirements for Oversight Bodies (Regulators)

For employees of independent regulatory bodies, **cognitive and institutional independence** is critical.[4]

- **Elimination of Conflict of Interest:** Former top managers of national energy monopolies (such as EPS in Serbia) [1] or vendor corporations must not be appointed to head inspectorates and oversight departments to avoid the phenomenon of "regulatory capture."
- **Training and International Benchmarking:** Given the loss of domestic competencies, a mandatory requirement for regulators in newcomer countries must be to complete internships and extensive courses in oversight structures of countries with a benchmark safety culture (e.g., STUK in Finland or ASN in France).[46] This will instill in employees an understanding of how to provide strict oversight without descending into paralyzing bureaucratic red tape.[24]

4.3. Competency Matrix and the Attraction of Expats

Official IAEA documents (Competency framework) recommend creating specialized matrices to audit existing knowledge within departments and identify "gaps."[44] In the context of Serbia, where there is a historic shortage of nuclear engineers [1], the national bureaucracy must integrate international consultants into its structures and utilize the human capital of qualified expats (including from the multi-thousand Russian diaspora possessing relevant STEM education).[1] These specialists, devoid of local corrupt ties, can act as independent filters for technical and financial documentation during the technology selection stages (Pre-project phase).[17]

5. Financial and Property Interests: Corruption at the Macro and Micro Levels

An analysis of behavioral models would be incomplete without examining the powerful shadow financial motives permeating the administrative apparatus. Nuclear megaprojects, due to their unprecedented cost, bilateral monopoly (state-customer and a limited circle of vendors-suppliers), and high technological information asymmetry, generate colossal corruption risks.[9] The risk of misappropriation of funds, kickbacks, and falsifications permeates all levels of management: from ministers to local officials.

5.1. Macro Level: Vendor Contracts, Bribes, and Offshore Schemes

Concluding international agreements for NPP construction and long-term contracts for nuclear fuel supply represents the most lucrative target for the top bureaucracy.

- **The Sanctions Precedent of Kozloduy NPP (Bulgaria):** An illustrative example is the investigation by the US Treasury Department, which in 2023 applied Magnitsky Act sanctions against former general directors of the Bulgarian Kozloduy NPP, Ivan Genov and Aleksandar Nikolov, as well as former energy minister Rumen Ovcharov.[11] It was established that officials coordinated schemes to divert NPP service contracts in favor of their own business structures. Ovcharov, receiving

millions in bribes (over 5.3 million euros transferred to offshore accounts), lobbied for fixed-price contracts for the supply of Russian nuclear fuel and gas, leading to an overpricing of services for the station by up to 50 million euros.[11] Such practices undermine a country's energy security for the sake of elite personal enrichment.[11]

- **Scandals at Rooppur NPP (Bangladesh):** Similar processes were observed during the implementation of Bangladesh's largest infrastructure project. In addition to subcontractor corruption, which resulted in the installation of substandard safety systems and broken elevators in housing for engineers [1], accusations arose against top political functionaries (relatives of the state's top leaders) of embezzling billions of dollars from project funds with the assistance of foreign contractors.[50]

An analysis conducted by the Corruption Research Center Budapest (CRCB) regarding the Paks-2 NPP project summarizes: in transition economies prone to crony capitalism, between 5% and 16% of a nuclear project's budget (hundreds of billions of forints or euros) can be permanently lost to corruption costs due to opaque tenders and a lack of strict independent monitoring.[9]

5.2. Meso Level: Supply Chain Falsifications and the Threat to Radiation Safety

Corruption at the level of state energy company executives and regulatory bodies poses a direct threat to national security.

- **The "Nuclear Mafia" Case in South Korea (2012-2014):** The largest scandal in history revealed deeply entrenched cronyism among the station operator (KHNP), officials, and private manufacturers.[51] In an effort to maximize profits and accelerate export deliveries (including components for the Emirati Barakah NPP), Korean suppliers, colluding with KHNP managers, falsified over 2,114 quality certificates and seismic test reports.[51]
- Tenders were manipulated using absurd methods (literally playing "rock-paper-scissors" among corporate top managers) under the guise of fictitious duplicate bids.[51] As a result, defective control cables (from JS Cable) and unreliable transformers were installed in the reactors.[51] It is telling that the Korean regulator (KINS), which received 60% of its funding from the operator it was auditing (KHNP), turned a blind eye to these violations.[51]
- The result was the emergency shutdown of several power units, losses amounting to 8.4 billion US dollars, the threat of rolling blackouts across the country, and a massive blow to the reputation of Korean technologies on the global stage (including the loss of trust from the UAE).[34]
- This experience serves as a stark warning: corruption not only reduces economic efficiency but directly correlates with an increased probability of Fukushima-type accidents.[9]

5.3. Micro Level: Local Bureaucracy, Land Speculation, and Lobbying

The financial interests of local officials and administrations are no less destructive. Possessing insider

information about shortlists of potential sites (Siting) for NPP construction, local elites can buy up agricultural land through proxies to later sell it to the state at a vastly inflated price through eminent domain procedures.[27]

- **Tax and Lobbying Schemes in the US:** In developed countries, local corruption takes sophisticated forms. In New Jersey, the company Holtec was caught falsifying tax break applications, hiding information about investments by a subsidiary to double the state subsidy amount for developing SMR infrastructure.[52]
- An even larger crisis occurred in Ohio (the HB6 scandal), where the FirstEnergy corporation admitted to paying 60 million dollars in "dark money" to structures controlled by State House Speaker Larry Householder and Public Utilities Commission Chairman Sam Randazzo.[53] The goal of this largest corruption conspiracy in the state's history was to push through a bailout law for unprofitable coal and nuclear plants and block alternative energy.[53]

The conclusion is obvious: civil servants at all levels have powerful motives to instrumentalize nuclear energy development for personal and corporate enrichment.[55] If Serbia does not implement strict anti-corruption tools (including independent audit institutions, involvement of international NGOs, and EU-standard tender transparency), the billions invested in the energy transition will be expropriated by bureaucratic clans.[5]

Management Level	Typology of Corruption Risks and Financial Interests	Examples from International Practice	Consequences for the Project
Macro (Ministers, Politicians)	Siphoning of funds through offshores, kickbacks from foreign vendors for technology selection and long-term service contracts.[11]	Bulgaria (Kozloduy NPP) [11], Bangladesh (Rooppur NPP).[50]	Multiple overpricing of fuel (by millions of euros), geopolitical dependence.[11]
Meso (State company management and regulators)	Falsification of safety certificates, tender collusion for component procurement, conflict of interest.[51]	South Korea ("Nuclear Mafia", fake JS Cable components).[34]	Catastrophic drop in safety, losses up to $8.4 billion due to downtime, and reputational costs.[51]
Micro (Local authorities, regional elites)	Land speculation, blackmail during permit issuance, illegal receipt of regional tax breaks.[27]	USA (Holtec scandals in NJ, FirstEnergy/HB6 in Ohio).[52]	Delays during the Siting stage, drain of funds from local budgets, growing public

Management Level	Typology of Corruption Risks and Financial Interests	Examples from International Practice	Consequences for the Project
			distrust.[1]

6. Political Economy: The Decisive Role of Clan Struggles and the Geopolitics of Vendor Selection

The decision to build an NPP is fundamentally different from any other infrastructure project. Choosing an international supplier (vendor) means establishing a deep technological, financial, and political dependency for the recipient country for a period of 60 to 100 years (construction, operation, and decommissioning periods).[3] Therefore, the choice of vendor is rarely dictated solely by the reactor's energy efficiency parameters; it is determined by internal political economy, the balance of power among various state clans, and their foreign policy orientations.[12]

6.1. Autocratic Advantages and Export Potential

An analysis of the political economy of nuclear exports reveals a colossal competitiveness gap between two groups of global suppliers, directly impacting the behavior of national elites in newcomer countries.[3]

- **Group A (Vendors with extensive state support):** State giants like Russia's Rosatom and China's CNNC. The political systems of these states grant them an **"autocratic advantage"**.[12] Authoritarian leaders, unconstrained by short electoral cycles or pressure from the opposition and environmental movements, can mobilize sovereign resources for strategic expansion.[12] They offer newcomer countries (e.g., Turkey, Bangladesh, Belarus) not just a reactor, but comprehensive packages: preferential state loans, full fuel cycle provision, assistance with personnel training, and sometimes accompanying political and military guarantees.[1] This approach (the "Boeing 747 model"—mass production of standardized reactors like VVER or Hualong One) reduces costs and construction times.[3] For political clans in newcomer countries, such offers are extremely attractive as they form solid patron-client relationships that provide political protection and access to rent without the complex search for market financing.[6]
- **Group B (Vendors with limited state support):** Western corporations (Westinghouse, EDF). Operating in democratic, market-driven conditions, they depend on public opinion volatility, strict regulatory oversight, and private capital.[12] The Western model has focused on creating unique, overly complex designs (design innovation, the "Concorde model"—e.g., the EPR reactor with four safety loops), which has led to paralyzed supply chains, massive delays, and an inability to compete on price.[3] Western vendors cannot offer sovereign loans of the same scale and shift financial risks to the host country. Examples include the bankruptcy of America's Westinghouse or the state

bailout of France's Areva.[3]

6.2. Internal Struggles in Transition Economies (The Case of Serbia)

For a country like Serbia, balancing the desire for EU integration, American investments, and historically strong economic and energy ties with Russia and China [1], the problem of choosing a vendor turns into an existential political conflict.[17]

Various institutional clans, ministries, and intelligence services may act as informal lobbyists for different geopolitical power centers:

- **The Euro-Atlantic Clan:** Will argue for Western technologies (e.g., a partnership with France's EDF [1]) as a guarantee of political loyalty to the West, access to EU grants and green financing mechanisms, and avoiding secondary sanctions, which have already pressured the Petroleum Industry of Serbia (NIS).[1]
- **The Eastern Clan:** Will lobby for the interests of Rosatom or Chinese corporations, citing their readiness to provide financing (including offset programs and the construction of nuclear science centers, as discussed by Serbian leadership [1]), high project execution speeds, and the absence of political conditions (human rights conditionality).[12]

How decisive is this internal struggle? Global experience shows that **it is absolutely fatal**. If the political elite cannot reach a firm, cross-party consensus before the investment phase begins, the project is doomed. Revising agreements with vendors due to government changes or pressure from geopolitical lobbyists leads to disasters akin to the situation in Bulgaria, where canceling contracts with the Russian side for the Belene NPP project cost the national budget hundreds of millions of euros in arbitration penalties with absolutely no result.[11] Intra-clan struggles for control over contracts and financial flows can completely paralyze NEPIO and turn Serbia into an arena for proxy conflicts between superpowers at the expense of the national budget.[3]

Conclusion: Crisis Management Architecture

The exhaustive analysis of international precedents and bureaucratic behavioral patterns in the context of renewing the nuclear program in the Republic of Serbia leads to an unequivocal conclusion: **the main threat to nuclear energy is not public radiophobia, but institutional incompetence, corruption, and administrative paralysis of the state apparatus**.[1]

To ensure that the risks of bureaucratization and process delays do not become fatal (as happened with the V.C. Summer projects in the US or scandals in South Korea [33]), political leadership must implement a comprehensive transformation of the managerial architecture. The strategic plan (roadmap) for public administration must be based on the following imperatives:

1. **Creation of a competent and depoliticized institute (NEPIO):** The Nuclear Energy Programme Implementing Organization must be shielded from the influence of short-term electoral cycles.

Appointments to NEPIO must be made exclusively based on IAEA standards (GSR Part 2 and NLP programs), focusing on systemic thinking, project financing skills, and safety culture leadership, rather than a technical background of a Soviet or Yugoslav model.[40]

2. **Isolating the regulator and preventing "Regulatory Capture":** The independent oversight body must receive unprecedented guarantees of financial and political independence from energy monopolies (EPS) and vendors. A mandatory requirement is for inspectors to intern at leading foreign agencies to forge a culture of strict but adaptive licensing, avoiding a descent into paralyzing risk aversion.[4]
3. **Institutionalization of transparency and an anti-corruption filter:** Given the precedents of multi-million dollar embezzlements (Kozloduy, Rooppur, the "nuclear mafia" case [11]), the entire contracting cycle must be subject to continuous audits. It is necessary to legally restrict the opportunities for local administrations to engage in speculation and blackmail by creating transparent mechanisms for distributing compensation payments (Community Benefit Agreements).[1] The involvement of international experts and highly qualified expats is mandatory to overcome information asymmetry in dialogues with vendors.[5]
4. **Synchronization of the state apparatus:** Overcoming the "silo" effect requires the appointment of a special deputy prime minister endowed with dictatorial powers for cross-functional coordination between the ministries of finance, infrastructure, education, and ecology.[16]
5. **Cross-party geopolitical consensus:** Before making the final investment decision and choosing a technological partner (from Group A or Group B [3]), elites are obligated to forge a long-term pact ensuring the continuity of the policy course despite changes in government, to eliminate the risk of the project falling victim to clan political struggles and to avoid multi-billion dollar arbitration lawsuits.[11]

Only by overcoming its own institutional flaws and implementing strict discipline and advanced IAEA governance standards will Serbia be able to realize its ambitious plan for energy sovereignty and decarbonization by 2040, avoiding the fate of states whose nuclear ambitions shattered against corruption and bureaucratic chaos.[1]

Sources for Part 2

1. Моделирование социальных реакций на АЭС.docx
2. The Sovereign Signal: Nuclear Energy as Strategic Infrastructure - American Affairs Journal, дата последнего обращения: апреля 26, 2026, https://americanaffairsjournal.org/2025/11/the-sovereign-signal-nuclear-energy-as-strategic-infrastructure/
3. The Nuclear Energy Race: The West's Three-Pillar Failure in Leadership (Volume 21, Issue 1), дата последнего обращения: апреля 26, 2026, https://www.yalejournal.org/publications/the-nuclear-energy-race-the-wests-three-pillar-failure-in-leadership-mldlc
4. Newcomer countries face common challenges in nuclear infrastructure development - International Atomic Energy Agency, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull57-1/5712832-iaeanews.pdf
5. New nuclear requires strong governance to avoid making old mistakes, дата последнего обращения: апреля 26, 2026, https://news.engin.umich.edu/2025/12/new-nuclear-requires-strong-governance-to-avoid-making-old-mistakes/
6. (PDF) PATRON-CLIENT NETWORKS AND PUBLIC UTILITY FOR INCUMBENT POLITICIANS IN ELECTIONS: A BIBLIOMETRIC ANALYSIS - ResearchGate, дата последнего обращения: апреля 26, 2026, https://www.researchgate.net/publication/401365579_PATRON-CLIENT_NETWORKS_AND_PUBLIC_UTILITY_FOR_INCUMBENT_POLITICIANS_IN_ELECTIONS_A_BIBLIOMETRIC_ANALYSIS
7. Real-World Nuclear Decision Making: Using Behavioral Economics Insights to Adjust Nonproliferation and Deterrence, дата последнего обращения: апреля 26, 2026, https://www.nonproliferation.org/wp-content/uploads/2016/01/160112_behavioral-economics-and-nuclear-weapons.pdf
8. Exploring the impact of political patronage networks on financial stability: Lebanon's 2019 economic crisis - EconStor, дата последнего обращения: апреля 26, 2026, https://www.econstor.eu/bitstream/10419/329109/1/economies-12-00183.pdf
9. The Corruption Risks of the Nuclear Power Plants: what can ... - CRCB, дата последнего обращения: апреля 26, 2026, https://www.crcb.eu/wp-content/uploads/2014/12/paks_2014_summary_en_141023_00051.pdf
10. A Strategy for Financing the Nuclear Future - National Center for Energy Analytics, дата последнего обращения: апреля 26, 2026, https://energyanalytics.org/financing-the-nuclear-future/
11. Bulgaria / Three Placed On US Sanctions List Over Corruption ..., дата последнего обращения: апреля 26, 2026, https://www.nucnet.org/news/three-placed-on-us-sanctions-list-over-corruption-related-to-kozloduy-nuclear-power-station-2-5-2023
12. Full article: The rise of the autocratic nuclear marketplace, дата последнего обращения: апреля 26, 2026, https://www.tandfonline.com/doi/full/10.1080/01402390.2022.2052725
13. Economic Analysis, Risk Regulation, and the Dynamics of Policy Regret (Chapter 2), дата последнего обращения: апреля 26, 2026, https://www.cambridge.org/core/books/policy-shock/economic-analysis-risk-regulation-and-the-dynamics-of-policy-regret/BCD2CC43B47F496880DDE22904BFAF52
14. Behavioral Economics and Nuclear Weapons | FSI, дата последнего обращения: апреля 26, 2026, https://cisac.fsi.stanford.edu/publication/behavioral-economics-and-nuclear-weapons
15. The Political Economy of Nuclear Energy in the United States - Brookings Institution, дата последнего обращения: апреля 26, 2026, https://www.brookings.edu/articles/the-political-

economy-of-nuclear-energy-in-the-united-states/
16. Newcomer Countries Face Common Challenges in Nuclear Infrastructure Development, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/newscenter/news/newcomer-countries-face-common-challenges-nuclear-infrastructure-development
17. Emerging Nuclear Energy Countries, дата последнего обращения: апреля 26, 2026, https://world-nuclear.org/information-library/country-profiles/others/emerging-nuclear-energy-countries
18. Funding and financing nuclear power plants and facilities | IAEA, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/topics/funding-and-finance
19. Financing nuclear projects – The Path to a New Era for Nuclear Energy – Analysis - IEA, дата последнего обращения: апреля 26, 2026, https://www.iea.org/reports/the-path-to-a-new-era-for-nuclear-energy/financing-nuclear-projects
20. Milestones Guide Newcomer Countries on Road to Nuclear Power, дата последнего обращения: апреля 26, 2026, https://www.ans.org/pubs/magazines/download/article-935/
21. IAEA Report DOC, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/mtcd/meetings/pdfplus/2008/35095/35095_nepio.doc
22. Financing Nuclear Energy, дата последнего обращения: апреля 26, 2026, https://world-nuclear.org/information-library/economic-aspects/financing-nuclear-energy
23. Regulatory framework for nuclear installations | IAEA, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/topics/nuclear-installations
24. The NRC's Problem Isn't Caution. It's Architecture. - The Breakthrough Institute, дата последнего обращения: апреля 26, 2026, https://thebreakthrough.org/issues/nuclear-energy-innovation/the-nrcs-problem-isnt-caution-its-architecture
25. Why U.S. Nuclear Licensing Moves So Slowly | The Regulatory Review, дата последнего обращения: апреля 26, 2026, https://www.theregreview.org/2026/01/03/seminar-why-u-s-nuclear-licensing-moves-so-slowly/
26. Society and Nuclear Energy: Case Histories of Practical Communication Experiences, дата последнего обращения: апреля 26, 2026, https://preparecenter.org/wp-content/uploads/2021/04/society-case-studies.pdf
27. Full article: Negotiating Nuclear Power Project Agreements in Emerging Economies—Safeguarding Local Community Interests - Taylor & Francis, дата последнего обращения: апреля 26, 2026, https://www.tandfonline.com/doi/full/10.1080/00295450.2026.2612756
28. Regulatory Induced Risk Aversion in Coal Contracting at US Power Plants: Implications for Environmental Policy - The University of Chicago Press: Journals, дата последнего обращения: апреля 26, 2026, https://www.journals.uchicago.edu/doi/full/10.1086/715885
29. Volume two Case studies on customary land and development in the Pacific - SPREP, дата последнего обращения: апреля 26, 2026, https://www.sprep.org/att/IRC/eCOPIES/Pacific_Region/251.pdf
30. The Political Economy of State-building in Situations of Fragility and Conflict: from Analysis to Strategy - Clingendael, дата последнего обращения: апреля 26, 2026, https://www.clingendael.org/sites/default/files/pdfs/20120100_cru_political_economy.pdf
31. IAEA Nuclear Energy Series Project Management in Nuclear Power Plant Construction: Guidelines and Experience, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1537_web.pdf
32. Nuclear Technology Management: IAEA Guidance for University Programmes, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/newscenter/news/nuclear-technology-

management-iaea-guidance-for-university-programmes
33. Nuclear energy: The decade of deliverability, дата последнего обращения: апреля 26, 2026, https://www.ans.org/news/article-7317/nuclear-energy-the-decade-of-deliverability
34. Middle East Nuclear Energy Monitor 2019 - AUB, дата последнего обращения: апреля 26, 2026, https://aub.edu.lb/ifi/Documents/publications/research_reports/2019-2020/Energy_Monitor_2019_Report.pdf?utm_source=BenchmarkEmail&utm_campaign=20190103_-_Middle_East_Nuclear_Energy_Monitor_A_Decade_Later%3A_South_Korea%E2%80%99s_Nuclear_Energy_Exports_t&utm_medium=email
35. World Nuclear Industry Status Report 2025 (HTML version), дата последнего обращения: апреля 26, 2026, https://www.worldnuclearreport.org/World-Nuclear-Industry-Status-Report-2025-HTML-version
36. Nukegate scandal - Wikipedia, дата последнего обращения: апреля 26, 2026, https://en.wikipedia.org/wiki/Nukegate_scandal
37. Welcome to the IAEA Nuclear Infrastructure Competency Framework, дата последнего обращения: апреля 26, 2026, https://nucleus.iaea.org/competency-framework/
38. IAEA Nuclear Infrastructure Competency Framework (CF), дата последнего обращения: апреля 26, 2026, https://www.iaea.org/sites/default/files/20/11/nicf.pdf
39. IAEA Nuclear Infrastructure Competency Framework | International Atomic Energy Agency, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/resources/brochure/iaea-nuclear-infrastructure-competency-framework
40. USA-IAEA Nuclear Leadership Programme - International Atomic ..., дата последнего обращения: апреля 26, 2026, https://www.iaea.org/sites/default/files/25/06/evt2501876-information-sheet.pdf
41. IAEA Safety Standards Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/PUB2029_web.pdf
42. No. NG-G-2.1 - Scientific, technical publications in the nuclear field | IAEA, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1397_web.pdf
43. Leadership and management for safety - Scientific, technical publications in the nuclear field | IAEA, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1750web.pdf
44. Mapping Organizational Competencies in Nuclear Organizations - Scientific, technical publications in the nuclear field | IAEA, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1844_web.pdf
45. Selection, competency development and assessment of nuclear ..., дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/te_1024_prn.pdf
46. Training the staff of the regulatory body for nuclear facilities: A competency framework, дата последнего обращения: апреля 26, 2026, http://www-ns.iaea.org/downloads/ni/training/rgbd_trg.pdf
47. School of Nuclear Energy Management | IAEA, дата последнего обращения: апреля 26, 2026, https://www.iaea.org/services/education-and-training/schools/school-of-nuclear-energy-management
48. Competency Assessments for Nuclear Industry Personnel, дата последнего обращения: апреля 26, 2026, https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1236_web.pdf

49. Syndromes of Corruption: Wealth, Power, and Democracy - SciSpace, дата последнего обращения: апреля 26, 2026, https://scispace.com/pdf/syndromes-of-corruption-wealth-power-and-democracy-3te6kzx90h.pdf
50. The Rooppur Power Plant Scandal - Corruption Tracker, дата последнего обращения: апреля 26, 2026, https://corruption-tracker.org/case/the-rooppur-power-plant-scandal
51. South Korea's corrupt and dangerous nuclear industry - WISE ..., дата последнего обращения: апреля 26, 2026, https://www.wiseinternational.org/south-koreas-corrupt-and-dangerous-nuclear-industry/
52. Holtec to pay $5M fine, staves off criminal prosecution | NJ Spotlight News, дата последнего обращения: апреля 26, 2026, https://www.njspotlightnews.org/2024/01/holtec-camden-will-pay-5-million-fine-false-documents-nj-tax-breaks-controversial-nuclear-projects/
53. Ohio corruption trial traces tactics to prop up nuclear and coal plants | News From The States, дата последнего обращения: апреля 26, 2026, https://www.newsfromthestates.com/article/ohio-corruption-trial-traces-tactics-prop-nuclear-and-coal-plants
54. Nuclear bailout tied to bribery scandal was years in making | PBS News, дата последнего обращения: апреля 26, 2026, https://www.pbs.org/newshour/nation/nuclear-bailout-tied-to-bribery-scandal-was-years-in-making
55. Nuclear Power Runs on Dirty Money: The Corporate Scandal of the Proposed National Nuclear Subsidy - NIRS, дата последнего обращения: апреля 26, 2026, https://www.nirs.org/nuclear-power-runs-on-dirty-money-the-corporate-scandal-of-the-proposed-national-nuclear-subsidy/
56. The Changing Geopolitics of Nuclear Energy, дата последнего обращения: апреля 26, 2026, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/200416_Nakano_NuclearEnergy_UPDATED%20FINAL.pdf
57. (PDF) PATRON-CLIENT LINKAGES PUBLICATION - ResearchGate, дата последнего обращения: апреля 26, 2026, https://www.researchgate.net/publication/369879610_PATRON-CLIENT_LINKAGES_PUBLICATION
58. Challenges in nuclear energy adoption: Why nuclear energy newcomer countries put nuclear power programs on hold? - Oak Ridge National Laboratory, дата последнего обращения: апреля 26, 2026, https://impact.ornl.gov/en/publications/challenges-in-nuclear-energy-adoption-why-nuclear-energy-newcomer