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Nuclear Power Policy in Russia

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Key Questions

- What is the role of nuclear power contracts in Russian foreign policy?
- What are the determinants of a nuclear-intensive economy?
- Is it possible to link nuclear innovation with social distribution?
- Why is French-Russian cooperation of vital importance for global nuclear security?

Contributions

- Nuclear power: critical element for Russia's active engagement in international institutions, global environmental negotiations, and European energy security.
- Nuclear power contracts by Rosatom → increased market presence abroad, and social distribution at home.
- Transition to generation-III nuclear reactors: poverty reduction and modernization of the Russian economy.
- Global sustainability
  i. advanced nuclear-intensive economy (France): high level of nuclear technology transfers
  ii. emerging nuclear-intensive economy (Russia): adherence to interstate and multilateral norms.

Outline

I. Uranium after the Cold War: Russia as an Emerging Economy

I. Russian Nuclear Sector I: Innovation and Regulatory Governance

II. Russian Nuclear Sector II: Production Intensity and Sustainability

III. Russian Foreign Policy I: Nuclear Power and Social Distribution

IV. Russian Foreign Policy II: France as Nuclear Innovator

V. Conclusions

Uranium after the Cold War (1/3)

- Russia's vast uranium reserves: long-term commitment to the expansion of nuclear technology and dynamic entry into the global market of nuclear infrastructure contracts.
- Nuclear sector: not comparable with the oil and natural gas sectors in Russia's economic growth in the 2000s.
- Nuclear infrastructure contracts in Turkey and India and collaborative schemes with Siemens or EDF → high political rents for the Russian government.
- Commitment to nuclear innovation → state competitiveness in international energy markets.

Uranium after the Cold War (2/3)

- Nuclear technology transfer from one state to another: excessive investment costs, unlikely dissolution of an alliance.
- Centralized nature of nuclear power regulation in Russia: formation of alliances without the interference of domestic or global regulatory norms.
- Hierarchical regulatory system: public financing for innovation.
- Nuclear innovation: public revenues from the oil and gas sectors, corporate governance practices in the electrical power industry (Tsvetkov, 2006).

Uranium after the Cold War (3/3)

Production from mines (tonnes U) - WNA Global Nuclear Fuel Market Report data

Country	2006	2007	2008	2009	2010	2011	**2012**	**2013**
Kazakhstan	5279	6637	8521	14020	17803	19451	21317	22574
Canada	9862	9476	9000	10173	9783	9145	8999	9332
Australia	7593	8611	8430	7982	5900	5983	6991	6350
Niger (est)	3434	3153	3032	3243	4198	4351	4667	4528
Namibia	3067	2879	4366	4626	4496	3258	4495	4315
Russia	3262	3413	3521	3564	3562	2993	2872	3135
Uzbekistan (est)	2260	2320	2338	2429	2400	2500	2400	2400
USA	1672	1654	1430	1453	1660	1537	1596	1835
China (est)	750	712	769	750	827	885	1500	1450
Malawi				104	670	846	1101	1132
Ukraine	800	846	800	840	850	890	960	1075
South Africa	534	539	655	563	583	582	465	540
India (est)	177	270	271	290	400	400	385	400
Czech Republic	359	306	263	258	254	229	228	225
Brazil	190	299	330	345	148	265	231	198
Romania (est)	90	77	77	75	77	77	90	80
Pakistan (est)	45	45	45	50	45	45	45	41
Germany	65	41	0	0	8	51	50	27
France	5	4	5	8	7	6	3	0
Total world	**39 444**	**41 282**	**43 764**	**50 772**	**53 671**	**53 493**	**58 394**	**59,637**
tonnes U_3O_8	46 516	48 683	51 611	59 875	63 295	63 084	68 864	70,330
percentage of world demand	63%	64%	68%	78%	78%	85%	86%	92%

Russian Nuclear Sector I (1/5)

- Key significance of electrical power in consumer welfare: nuclear power – social policy instrument.

- Primary public goods by a nuclear-intensive economy: environmental protection through pollution abatement and social welfare through efficient electricity generation.

- Arguments against nuclear expansion (Schneider, 2000):
  i. high sunk costs
  ii. proliferation of nuclear weapons
  iii. insufficient guarantees for nuclear waste disposal and decommissioning.

Russian Nuclear Sector I (2/5)

Definition of a *nuclear-intensive economy* .

i. Above average levels of electricity demand: population size, climate, industry size, or a combination of some of those factors.
ii. Sufficient degree of macroeconomic stability: high sunk costs required for the construction of nuclear infrastructure.
iii. Renewable energy technologies: not a central policy priority of the government.
iv. Regional power status: suboptimal security advantage in the international community.

Russian Nuclear Sector I (3/5)

Russia maintains three types of organizational entities in its nuclear sector:

i. Ten atomic energy stations
ii. Four processing companies
iii. Four exploration companies (Rosatom 2008).

In the Russian nuclear sector, there are thirty one reactors:

i. Fifteen pressurized water reactors (nine VVER-1100 and six VVER-440)
ii. Fifteen channel boiling reactors (eleven RBMK-1000 high power channel type reactors and four EGP-6 graphite channel power reactors with steam overheat)
iii. One fast neutrons reactor (BN-600) (Rosatom 2008).

Russian Nuclear Sector I (4/5)

Rosatom

i. Institutional framework for domestic and overseas activities of the Russian nuclear industry.
ii. *Goskorporatsiya*: combination of multidivisional (M-form) and unitary (U-form) organizational schemes → state control and corporate profitability.
iii. Focus of interest: from domestic to external operations.
iv. Atomstroyexport and Tenex: nuclear constructor and uranium trader for overseas operations respectively.

Russian Nuclear Sector I (5/5)

- State corporations: special status of institutional immunity within the Russian political system
  i. no administrative agency can oversee their activities, control their financial accounts, or confiscate their property, for any reason (Deliagin 2008).

- Rosatom: quasi-ministry of the Russian government that combines the budgetary support of a public institution, the functional independence of a private institution, and some extraordinary functions related to its social policy objectives (Avdasheva and Simachev 2009).

- Objectives:
  i. increase of the share of nuclear power to overall energy production from 16 to 25% by 2020.
  ii. twenty-six new nuclear plants in Russia, and five new nuclear plants abroad → 40% of the world market for uranium enrichment and 17% of the world nuclear fuel market.

Russian Nuclear Sector II (1/3)

- Shift to high temperature nuclear reactors → social distribution.
- The substitution of fission with fusion in the ITER project (a joint scientific initiative by China, the EU, India, Japan, South Korea, Russia, and the United States) → sustainability as an inherent feature of a distributive nuclear energy industry.
- In Russia: nuclear power-based distribution likely, when state revenues from nuclear industry approximate state revenues from oil and gas sectors.

Russian Nuclear Sector II (2/3)

- Gazprom: subject to the Russian government, but also to the WTO, the European Commission, foreign governments, and transnational arbitration courts.
- Rosatom: subject only to the decision-making authority of the Kremlin.
- Hierarchical regulation by a single state jurisdiction: not sufficient innovation incentives.
- Reasons for Russia's nuclear intensity: drastic increase of uranium exports and flourishing construction activities of Atomstroyexport.

Russian Nuclear Sector II (3/3)

- Export partnership between RAO UESR, Russia's electricity company, and Atomenergoatom: diversification of sources for domestic nuclear revenues.

- The design of the fast neutrons nuclear reactor (BN-800): signal that Russia is moving toward that direction of nuclear governance → cost effectiveness and environmental protection = sustainability.

- The distributive capacity of the Russian nuclear sector is contingent upon:
  i. strengthening of its quota in domestic electricity production
  ii. increase in innovation
  iii. boost in international competitiveness.

- Introduction of fusion technology: important step in that direction, which still has to be seen in Russia (CEA/Cadarache 2005).

Russian Foreign Policy I (1/3)

- Uranium market and Russian foreign policy in the post-Soviet space:
  i. Kazakhstan's access to Russian nuclear technology – key for enrichment of its uranium reserves.
  ii. Tekhnabexport and Kazatomprom → International Center for Uranium Enrichment in Angarsk, Irkutsk (October 2007): enriched uranium divided equally between the two sides.

- Rosatom's nuclear alliances in the developing world (Kazakhstan, Turkey, Iran, China): alleviation of security and economic externalities since the end of the Cold War.

Russian Foreign Policy I (2/3)

Table 1: Nuclear Technology and Distributive Justice

Nuclear Technology	**Nuclear Intensity**	
	Advanced Economies → E(N*) High	Emerging Economies → E(N*) Low
Reactor Type ≥ Generation III (High)	Scenario 1: Social distribution	Scenario 3: Poverty reduction
Reactor Type = Generation II (Low)	Scenario 2: Social inequality	Scenario 4: Negative externalities

Russian Foreign Policy I (3/3)

- Scenario 1: distribution in the form of lower prices and a cleaner environment.
- Scenario 2: emissions trading system → electricity price increase.
- Scenario 3: partial social distribution.
- Scenario 4: shift of uncertainty costs to citizens.

Russian Foreign Policy II (1/2)

Table 2: French-Russian Nuclear Cooperation

Innovator (France)	**Recipient (Russia)**	
	Adjustment to International Norms → Open Nuclear System (High)	Maintenance of Status Quo → Closed Nuclear System (Low)
Construction of Nuclear Reactors (High)	Scenario 1: Global Sustainability	Scenario 3: Political Alliance
Nuclear Waste Disposal (Low)	Scenario 2: Transnational Regulation	Scenario 4: Ad Hoc Contracts

Russian Foreign Policy II (2/2)

- Scenario 1: regulatory coordination between France and Russia → global governance of the nuclear sector.
- Scenario 2: adoption of French nuclear standards by Russian policy-makers.
- Scenario 3: no adjustment by Moscow.
- Scenario 4: uranium exports, occasional nuclear waste disposal, and common innovation projects.

Conclusions

- Transition to Gen-III reactors: poverty reduction and modernization for the Russia economy.
- Nuclear power-based social distribution in Russia: public revenues approximate those of oil and natural gas.
- Nuclear power contracts: foreign policy and innovation incentives.