

Nuclear Energy in the CEE Region and the Operation of Russian SOEs



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OP Vzdělávání
pro konkurenceschopnost



INVESTICE
DO ROZVOJE
VZDĚLÁVÁNÍ

CEE Region

- Belarus
- Bulgaria
- Czech Republic
- Estonia
- Hungary
- Latvia
- Lithuania
- Moldova
- Poland
- Romania
- Slovakia
- Ukraine



CEE Region

- The first step within the research process is mapping of nuclear sector and ties within the sector, as well as activities of the respective companies within European the region.
- The second step will be finding whether there is a certain model of behavior related to certain area/countries.



	1	2	3	4	5	6	7	8
Country	Is there a NPP in the country?	Is it of Russian design?	Is there a plan to expand the capacity or build new?	Does a Russian company take part in the procurement?	Is the expansion or the new NPP under construction?	Is the expansion or NPP of Russian design?	Is Russian company the contractor?	Who supplies fuel?
Belarus	No	-	Yes	Yes ZAO AtomStroyExport	Yes	Yes	Yes ZAO AtomStroyExport	OAo TVEL
Bulgaria	Yes	Yes	Yes	Yes Rosatom	No	No	No Westinghouse Electric Company LLC	OAo TVEL
Czech Republic	Yes	Yes, both of them	Yes	Yes ZAO AtomStroyExport and OAo OKB Gidropress, in a consortium with ŠKODA JS, a.s.	No	Unknown, tender cancelled	-	OAo TVEL
Estonia	No	-	No	-	-	-	-	-
Hungary	Yes	Yes	Yes	Yes Rosatom (No procurement process)	No	Yes	Yes Rosatom	OAo TVEL
Latvia	No	-	No	-	-	-	-	-
Lithuania	Not anymore, Ignalina NPP was shut down in 2009	Yes	Yes	No (not allowed)	No	No	No VAE Project Company (20% Hitachi-GE Nuclear Energy, Ltd.; 20% Latvia; 22% Estonia; and 38% Lithuania)	OAo TVEL was supplier for the Ignalina NPP
Moldova	No	-	No	-	-	-	-	-
Poland	No	-	Yes	No (likely not to be allowed)	No	No	No Contractor yet unknown	-
Romania	Yes	No	Yes	No (because the project is completion of different technology reactor)	No	No	No China General Nuclear Power Group	Domestic production in SN Nuclearelectrica's Pitesti Nuclear Fuel Plant

Slovakia	Yes	Yes, both of them	Yes, two	<p>Yes ZAO AtomStroyExport is one of the companies finishing Mochovce NPP; Rosatom in new Jaslovské Bohunice NPP unit (Procurement process not yet opened, direct negotiations preferred)</p>	Yes (Mochovce), No (Jaslovské Bohunice)	Yes (Mochovce), Yet unknown (Jaslovské Bohunice)	<p>No ZAO AtomStroyExport is one of sub-contractors for Mochovce</p> <p>No Jadrová energetická spoločnosť Slovenska, a. s. (51% Jadrová a vyrábavacia spoločnosť, fully owned by the Slovak Ministry of Economy; 49% ČEZ Bohunice a.s. fully owned by the Czech company ČEZ, a.s.)</p>	<p>OAO TVEL, from 2015 also undisclosed non-Russian company, likely AREVA SA</p>
Ukraine	Yes	Yes, all four of them	Yes	<p>Yes OAO OKB Hidropress won the tender</p>	No	<p>Unknown, project was cancelled due to Crimea crisis and other Western options are investigated, especially with Westinghouse Electric Company, LLC</p>	<p>DP NNEG Energoatom fully owned by Ministry of Energy and Coal Industry of Ukraine</p>	<p>OAO TVEL, partly (30%) using domestic uranium and IUEC enrichment facility; South Ukraine NPP's fuel is supplied by Westinghouse Electric Company LLC; from ca. 2020 domestic production of uranium and zirconium together with operation of VostGOK uranium processing plant in Zheltive Vody and the construction of nuclear fuel fabrication and fuel assemblies plant at Smolino (owned by 50% +1 State Concern "Nuclear Fuel" and 50% -1 OAO TVEL)</p>

Summary

- All Roads Lead to Rosatom
- Path Dependency is an Important Factor
- Russian Federation Adapts to Specific Needs and Conditions of Concrete Country
- Rosatom Comes with Finances
- Business Environment Sets the Operational Framework
- Delays Are Natural Part of the Process
- Dependency of VVER Reactors' Operators on OAO TVEL Fuel Supplier is not Inevitable
- Spent Fuel Treatment Procedure with Standard Risks

All Roads Lead to Rosatom

Ownership Structure of Russian Nuclear Energy Companies

Company	Shareholders	Share (%)
Rosatom State Atomic Energy Corporation	Government of Russian Federation	100
ZAO AtomStroyExport	Rosatom State Atomic Energy Corporation AO VPO Zarubezhatomenergostroy OAO TVEL OAO Gazprombank	78.5362 9.4346 1.3303 10.6989
OAO OKB Hidropress Experimental Design Bureau	OJSC Atomenergomash	100
OAO TVEL	OJSC Atomic Energy Power Corporation Atomenergoprom	100
JSC NIAEP	OJSC Atomic Energy Power Corporation Atomenergoprom	100
JSC Atomic Energy Power Corporation Atomenergoprom	Rosatom State Atomic Energy Corporation	100
JSC Inter RAO UES	Rosneftegaz Group FGC UES Group Minorities* INTER RAO Capital Norilsk Nickel Group VEB RusHydro Group	27.63 18.57 16.65* 13.93 13.21 5.11 4.92
OJSC Atomenergomash	OJSC Atomic Energy Power Corporation Atomenergoprom CJSC AEM Leasing INTERNEXCO GMBH OFEJSC Techsnabexport LLC Energomashkompleks	80.6296 2.3673 9.0896 2.8481 0.0453

* The minorities include ZAO AtomStroyExport, OJSC Rosenergoatom Concern, Rosatom Securities Limited. All these companies are part of the Rosatom State Atomic Energy Corporation which thus owns 13.42% stake in JSC Inter RAO UES.

Path Dependency is an Important Factor

- Evidence of relatively strong path dependency was found in the CEE countries' nuclear sectors.
- Of twelve analyzed countries six have a nuclear power plant on its soil. And every single one of these six countries has a plan to expand the capacity or construct a new NPP.
- These six countries are Bulgaria, Czech Republic, Hungary, Romania, Slovakia and Ukraine.
- Except for Bulgaria, where two VVER-1000 units are in operation and yet Westinghouse Electric Company LLC was accepted as geopolitically more favorable than the Russian offer and is the contractor for Kozloduy 7, all other mentioned countries followed the path dependency.

Russian Federation Adapts to Specific Needs and Conditions of Concrete Country

- The enormous price of every NPP construction project per se makes it extremely attractive for the contractors given the limited amount of such projects worldwide.
- However, given the financial burden of such projects, the contractors are often forced to financially participate in these projects since the governments simply cannot afford such enterprise by themselves.
- Rosatom State Nuclear Energy Corporation is very flexible in addressing the exact needs and conditions of concrete country.

Russian Federation Adapts to Specific Needs and Conditions of Concrete Country

- Besides generally accepted and sector-wide used options by all contractors, such as
 - vendor investments (most favorable option in current development in the Czech Republic)
 - being a strategic investor in the project (e.g. sharing the financial burden in exchange for getting stakes in the project and therefore revenues; this was the case of Czech Temelin NPP or Romanian Cernavoda NPP);
 - providing financial loans by national and private banks (the case of Bulgarian Kozloduy NPP, Ukrainian Kmelnitsky NPP or Hungarian Pakš NPP);
 - the turnkey-basis option (the case Belarusian Ostrovets NPP or Slovakian Jaslovské Bohunice NPP);
 - Rosatom developed the option where the contractor is the subject who pays for the construction.

Russian Federation Adapts to Specific Needs and Conditions of Concrete Country

- Quite recently a new type of contract has been introduced to the nuclear industry in this regard.
- It is called "Build-Own-Operate" (BOO) or "Build-Own-Operate-Transfer" (BOOT).
- Rosatom presents this type of contract as an "approach to support newcomers" that are not experienced in the field to enter the nuclear industry.
- This logic has been applied in the case of Turkish NPP Akkuyu, which will be the country's first nuclear unit (see World Nuclear News, 2010b), for the first time in nuclear industry.

Rosatom Comes with Finances

Country, NPP	Loan	Subject
Belarus, Ostrovets	USD 10 billion (for 25 years to finance 90% of the contract)	Eximbank, Vnesheconombank (one of the six Russian state corporations)
Bulgaria, Kozloduy	Has been offered several times	-
Czech Republic, Temelin	vendor financing offered towards the end of the public procurement process, up to 100% of the project costs	JSC Rusatom Overseas
Slovakia, Jaslovské Bohunice	Loan offer originally connected to governmental price guarantees, to the end of the process Rosatom stopped insisting on guarantess	Rosatom State Atomic Energy Corporation
Ukraine, Khmelnytsky	Russia will provide loan for 80-85% of the total costs estimated at EUR 3.7 billion. However Ukraine and Russia haven't yet agreed on the government guarantees for this loan, nor on the interest rate.	ZAO AtomStroyExport, Sberbank
Hungary, Paks	EUR 10 billion loan (80% of the total costs)	Russian Federation
Romania, Cernavoda	Russian bids are not allowed in the public procurement process in these countries, which is related to the business environment. (Alike in Lithuania and Poland)	-

Business Environment Sets the Operational Framework

- The historical ties and history-related policies play also an important role in the operational framework of Russian companies.
- The evidence leads us to a division of the analyzed nuclear countries into three categories:
 - pro-Western category with Bulgaria, Czech Republic, Lithuania and Romania
 - specific non-nuclear states that make efforts to enter the nuclear club but have a very bad history of relations to Russian Federation, these countries are Poland and the Baltic states
 - last category consists of CEE nuclear countries that are still close to the Russian Federation from political, historical or economical reasons; these are Belarus, Hungary and Ukraine even though since the Crimea crisis and its effect on Russian-Ukrainian nuclear business it is doubtful to categorize Ukraine exactly here

Delays Are Natural Part of the Process

- **Westinghouse's AP1000 at Vogtle NPP in Georgia**
 - from April 2016 to December 2017 (unit I) and December 2018 (unit II) with additional work costing some \$650 million
- **Rosatom's VVER-1200 at Novovoronezh II**
 - from 2012 (unit I) and 2013 (unit II) to 2014 for unit I and 2016 for unit II
- **AREVA's EPR at Finland's Olkiluoto-3**
 - from 2009 to the end of 2018; construction costs were first estimated at 3.2 billion euro, later in 2012, the CEO of AREVA estimated the overall cost would end up closer to 8.5 billion euro
- Although the reasons for these persistent delays and cost overruns are often not made public, they are generally caused by rising material costs, delayed subcontractors' work, accidents, increasing safety requirements and public opposition.

Dependency of VVER Reactors' Operators on OAO TVEL Fuel Supplier is not Inevitable

- Although there are many market subjects in every segment of the Front End, when speaking about the nuclear fuel as a final product for the VVER design reactors, the dominant producer is Russian company OAO TVEL.
- This company supplies fuel for each of the analyzed country except for Romania and partly Slovakia and Ukraine.
- Romania produces fuel domestically in SN Nuclearelectrica's Pitești Nuclear Fuel Plant.
- The Slovakian Government has discussed possibilities of reducing dependency on Russian nuclear fuel and in November 2014 information about closing contract for uranium fuel supply with non-Russian company emerged without any further details. The supplies should begin in 2015 and unofficial information suggests the new supplier is AREVA SA.