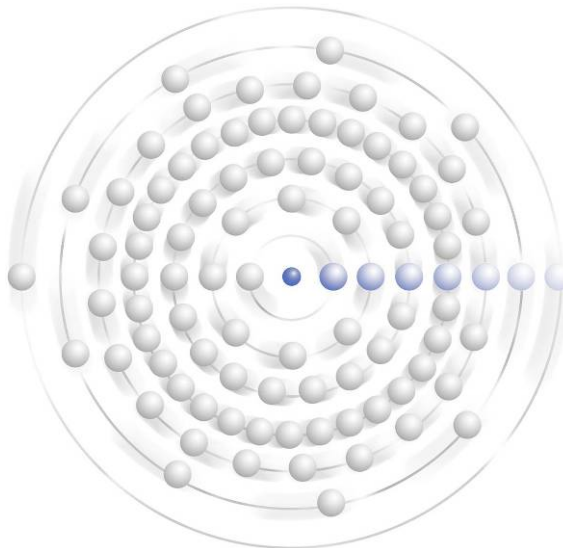




The Changing Geopolitics of the Nuclear Energy Market



Russia



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Table of Contents

1 – Introduction	9
The Complexities of Describing Russia’s Nuclear Complex	10
Organization of Report	11
Work in Progress	12
2 – Country Overview	13
Geography, People, Climate, and History	13
Government and Politics	14
Economy and Trade	15
• Pre-1998 Economy	15
• Post-1998 Economy	16
• Impact of the Current Financial Crisis	18
• Role of Nuclear Industry in Meeting Russia’s Economic Goals	19
Overview of the Energy Sector in Russia	19
• Electricity Supply Overview	20
• Russian Gas Supply Disputes	21
3 – Overview of Russia’s Nuclear Industry	22
History of Russian Nuclear Energy	22
Nuclear Industry Restructuring	23
State Corporations and their Structures	25
Current Status of the Civilian Nuclear Complex	26
• Rosatom and Kremlin – Role of the Federal Government	26
• Atomenergoprom	28
Electricity Sector in Russia	30
4 – Russia’s Domestic Nuclear Reactor Program	35
Reactor Program Overview	35
Nuclear Energy Capacity and Generation in Russia	35
• Energoatom Concern (Rosenergoatom)	35
• Nuclear Energy Capacity and Generation in Russia	36
Domestic Nuclear Energy Plans and Prospects	38
• State and Industry Plans	38
• Rosatom’s Current Domestic Reactor Plan to 2020	39
New Nuclear Power Plants	42
• Volgodonsk-2 (Rostov-2)	43
• Volgodonsk-3 and 4	43
• Kalinin-4	43
• Novovoronezh-II	44
• Leningrad-II	44
• Fast Breeders and Floating Nuclear Power Plants	45
Private Sector Involvement in Domestic Reactor Program	45
• Rosatom-Russian Machines SVBR Joint Venture	45
• Rosatom-RusAI	46
• Kursk-5	47
• Baltic Nuclear Power Plant	47
• Ownership Issues	48
UxC Reactor Capacity Forecast for Russia to 2030	48
• Explanation of UxC Reactor Forecast Cases	50
Base Case	50
High Case	52
Low Case	52
UxC Reactor Market Size Forecast for Russia to 2030	53

5 – Russia’s Nuclear Power Plant Exports	55
History of Russian-built Nuclear Plants Abroad	55
Atomstroyexport	57
Current Projects	58
• Bulgaria	58
• China	58
• India	58
• Iran	59
• Slovakia	59
Marketing Strategy	59
• Geographic Markets	59
• Review of All Russian Export Projects	61
• Export Reactor Joint Ventures and Alliances	63
• Export Reactor Contract Scopes	64
UxC Forecasts for Russian Export Reactors	64
UxC Forecast Cases for Russian Export Reactors	66
• Base Case	66
• High Case	67
• Low Case	68
Potential Russian Reactor Sales Based on UxC Forecasts	68
Final Thoughts on Building Nuclear Power Plants Abroad	70
6 – Reactor Design and Construction	71
Nuclear Power Plant Design Bureaus	71
Reactor Designs	71
• Reaktor Bolshoi Moshchnosti Kanalnyi (RBMK)	71
• Vodno-Vodyanoi Energeticheskii Reaktor (VVER)	72
• VVER-1200 (AES-2006)	74
• Super-VVER (VVER-1500 or V-448)	75
• Fast Neutron Reactors	75
• Small and Medium Size Reactors	77
Floating Nuclear Power Plants	77
VBER-300	78
VVER-600	79
• Other Reactors	79
Implementing Nuclear Reactor Projects	80
• St. Petersburg Atomenergoproekt (SPbAEP)	80
• Atomenergoproekt (Moscow)	80
• OJSC Nizhniy Novgorod Atomenergoproekt (NIAEP)	80
• The Role and Place of the Engineering Companies	81
• Potential Role of Private Sector in Nuclear Power Plant Construction	82
Nuclear Power Equipment Manufacturing	84
• OJSC Machine-Building Plant ZiO-Podolsk	85
• OJSC Engineering Company ZIOMAR	86
• OMZ-Izhora Group	86
• Power Machines	87
• Atomenergomash’s Expansion	88
Joint Ventures with International Companies on Reactor Supply Chain	89
• Alstom Atomenergomash, LLC	89
• Siemens-Power Machines	89
Future of Nuclear Power Equipment Manufacturing	90
7 – Uranium Mining Sector	92
Historical Background and Overview	92
• Uranium Mining in the Soviet Union	92
• Uranium Mining in the Russian Federation	93
Structure of the Uranium Industry in Russia	94

• Operating Mines in Russia	96
Priargunsky MMC	96
Khiagda	97
Dalur	97
• Planned/ Under Development Mines in Russia	97
Elkon (Aldonsky U District)	97
Lunnoye	98
Gornoye	99
Olov	99
• Service Companies	99
Foreign Uranium Joint Ventures for Exploration at Home and Abroad	100
• Exploration and Mining Abroad	100
• Kazakhstan	100
Budenovskoye 1, 3, 4 (Akbastau JV)	100
Zarechnoye	100
Karatau JV	100
• Armenia	101
• Namibia	101
• Mongolia	102
• Joint Ventures for Domestic Exploration	102
Canada-Cameco	103
Japan-Mitsui	103
France-AREVA	103
• ARMZ Mill and Mine Summary	103
Uranium Requirements and Forecasts	105
• Domestic Uranium Requirements	105
• Export Reactor Uranium Requirements	105
• Impact of Uranium Demand on Future Supply Considerations	107
Future Uranium Production Projections	108
• Development Plans of Uranium Mining Industry in Russia	108
• Future Uranium Production Projections	109
• Private Sector Involvement in Uranium Mining and Exploration	112
Secondary Supplies of Uranium	113
• Natural Uranium	113
• Highly Enriched Uranium (HEU)	113
• Reprocessed Uranium	114
• Depleted Uranium	114
8 – Uranium Conversion Sector	115
Historical Background	115
Russian Conversion Industry Today	115
• Main Enterprises	115
• OJSC United Company “Separation-Sublimation Complex” (United Company RSK)	116
• JSC Chepetsk Mechanical Plant (ChMZ)	116
• Siberian Chemical Combine (SCC)	116
• Angarsk Electrolyses Chemical Combine (AECC)	116
• Structure of the Conversion Industry in Russia	117
Conversion Production Methods	118
• Production of UF ₆	118
• Production of UF ₄	119
• Conversion Process of Natural Uranium (U ₃ O ₈) at SCC	120
Conversion Outlook	121
• Modernization of Conversion Sector	121
• Angarsk Electrolytic Chemical Combine	121
• Siberian Chemical Combine	122
• Chepetsk Mechanical Plant	122
Conversion Requirements and Forecasts	123
• Domestic Conversion Requirements	123
• Export Reactor Conversion Requirements	124

9 – Uranium Enrichment Sector	125
History and Background	125
Russian Enrichment Capacities	126
• Structure of the Russian Enrichment Complex	126
Reorganization of the Enrichment Sector	127
• Enrichment Enterprises	130
Urals Electrochemical Combine (UECC)	130
Angarsk Electrolysis and Chemical Combine (AECC)	131
Siberian Chemical Combine (SCC)	132
Production Association “Electrochemical Plant” (ECP)	132
Functional Description of the Facilities	133
Utilization of Russia’s Enrichment Capacity	133
• European Tails Enrichment	134
• Blendstock Production for the HEU Agreement	135
Techsnabexport (TENEX)	135
• 2007-20088 Techsnabexport’s Financial Results	136
HEU-LEU	137
• History and Background	137
• Current Status	137
• The Future of HEU in Russia	139
Second HEU Deal?	140
Use of HEU as Backup Supply	140
Plans for Expansion and Potential Impediments	141
• Enrichment Industry Modernization Program	141
• Russian Gas Centrifuge Program	142
• Uranium Enrichment Center	143
• Challenges to Capacity Expansion	144
Technological Challenges	144
Financial Challenges	145
Market Challenges	146
Export of Centrifuge Technology	147
Enrichment Requirements and Forecasts	148
• Domestic Enrichment Requirements	148
• Export Reactor Enrichment Requirements	149
10 – Fuel Fabrication Sector	150
History of Nuclear Fuel Fabrication in Russia	150
• Structure of TVEL Corporation	150
• OJSC Mashinostroitelny Zavod (Machine Building Plant, MSZ or Elemash), Elektrostal	153
• Novosibirsk Chemical Concentrates Plant (NCCP), Novosibirsk	153
• Chepetsky Mechanical Plant (ChMZ), Glazov	154
• Ulba Metallurgical Plant, Ust-Kamenogorsk, Kazakhstan	154
TVEL’s Role as a Regional Fuel Supplier	155
Fuel Designs	156
• VVER-440 and VVER-1000	156
• Competition in the Domestic Fabrication Market	157
• New Generation of VVER-1000 Fuel: TVSA-ALFA and TVS-2M	159
• AES-2006	159
TVEL’s Joint Ventures	159
• JV UkrTVS	159
Non-VVER Fuel Fabrication	160
• Fabrication of Fuel for LGRs	160
• Fuel for Reactors of Western Design	162
• Fuel for Fast Neutron Reactors	162
Plans for Fabrication Expansion and Potential Impediments	163
• Plans to Enter Market for Western-designed Fuel	163
• Fabrication Plant Abroad	164
Fabrication Requirements and Forecasts	164

• Domestic Fabrication Requirements.....	164
VVER Fuel Fabrication	164
RBMK Fuel Fabrication	165
• Export Reactor Fabrication Requirements.....	166
11 – Russia’s Role in World Nuclear Fuel Markets	167
Russia’s Targets for Nuclear Fuel Market Shares	167
Uranium Supply and Demand	170
Conversion Supply and Demand	171
Enrichment Supply and Demand	172
Fuel Fabrication Supply and Demand.....	173
Conclusions from Fuel Supply/Demand Balances	174
12 – Back-End of the Nuclear Fuel Cycle	175
Spent Fuel Management.....	175
Reprocessing Facilities	176
• RT-1 Radiochemical Plant (“Mayak,” Chelyabinsk).....	176
• RT-2 Plant (planned) (Mining and Chemical Combine, Zheleznogorsk).....	177
• SNF Legislation in Russia.....	177
International SNF Reprocessing Center	179
MOX Fuel Plans	179
Radioactive Waste Management and Disposal	180
• Final Thoughts on SNF and Nuclear Waste Management and Disposal.....	183
• Draft Law for SNF and Radwaste Management	183
Decommissioning and Dismantling of Nuclear Reactors	184
• Decommissioning Policies of the Russian Federation.....	184
• Foreign Assistance with Decommissioning.....	186
13 – International Nuclear Trade	187
Overview	187
Trade with the United States.....	188
• Agreement for Peaceful Nuclear Cooperation (123 Agreement)	188
• U.S.-Russia Suspension Agreement	190
• The Domenici Amendment	192
Trade with Europe.....	194
• The European Union.....	194
• Eastern Europe and Central Asia	196
Kazakhstan.....	196
Ukraine	196
Trade with Asia and Oceania	197
• Australia	197
• China.....	198
• India	198
• Japan	199
Trade with Africa	201
• South Africa	201
• Namibia.....	201
Trade with Middle East.....	202
• Turkey.....	202
• Iran.....	202
14 – Nuclear Nonproliferation Issues	203
HEU Stockpiles and Disposition.....	203
• Soviet HEU Production and Russian HEU Inventories	203
• The U.S.-Russian HEU Agreement	204
Accelerating HEU Downblending.....	205
Plutonium Stockpiles and Disposition	207
• Russian Plutonium Stockpiles.....	207

• Plutonium Disposition Plans	207
International Uranium Enrichment Center (IUEC) and Fuel Bank.....	209
• Structure of Angarsk Uranium Enrichment Complex	210
• Fuel Bank.....	212
15 – Strategic Analysis and Potential Future Scenarios	214
Inherent Strengths.....	214
• Political Consensus and Commitment to Nuclear Power.....	214
• Sustained Economic Growth.....	214
• Desire to Free up Oil and Natural Gas for Export	214
• Stated Goal of Diversification of Exports.....	215
• Russian Nuclear Export Advantages	215
• State Financing of the Nuclear Sector	215
• Strong R&D Base.....	215
Impediments to Growth	216
• Ongoing Global Financial Crisis.....	216
• Human Resource Constraints	216
• Supply Chain Constraints	216
• High Cost of Nuclear Power.....	217
• Restrictions on Private Sector Involvement	217
• Lack of Competition between Nuclear Enterprises	217
Potential Future Scenarios	218
• Scenario 1: Most Likely Case	218
• Scenario 2: Optimistic Case.....	219
• Scenario 3: Pessimistic Case	221
16 – Conclusions	223
Visions of the Future	223
Financial Crisis Correction	224
Last Words	225
Glossary	226
Appendix A – Timeline of Russia’s Nuclear Program	232
Appendix B – Selected Websites for Russian Organizations	235
Government Organizations.....	235
Government-Owned Corporations.....	235
Private Russian Corporations.....	236

List of Figures

Figure 1. Map of Russia	13
Figure 2. Russian GDP Percentage change, 1993-2007	17
Figure 3. Total Domestic Primary Energy Supply in 2006	20
Figure 4. Total Electric Power Generation in 2006.....	21
Figure 5. Structure of the State Corporation Rosatom.....	27
Figure 6. Structure of Atomenergoprom.....	29
Figure 7. Power Sector Structure in 2000	30
Figure 8. Target Sector Structure	31
Figure 9. Demand for Electricity in Russia, 1990-2020	31
Figure 10. Total Electricity Production in Russia.....	32
Figure 11. Pace of Wholesale Electricity Market Liberalization, 2006-2011	33
Figure 12. Reactors in Operation in the Russian Federation	36
Figure 13. Russian Nuclear Reactor Fleetwide Capacity Factor, 1992-2015.....	37
Figure 14. Rosatom’s Domestic Nuclear Reactor Plans	40

Figure 15. Planned Contributions of Different Reactor Types to Power Generation in Russia to 2050.....	42
Figure 16. Russia Nuclear Reactor Unit Forecasts Comparison, 2008-2030	49
Figure 17. Russia’s Installed Nuclear Capacity Forecasts, 2008-2030.....	49
Figure 18. Russia Reactor Market Size Forecasts, 2009-2030.....	53
Figure 19. UxC Forecasts for Russian Export Reactor Units, 2008-2030.....	65
Figure 20. UxC Forecasts for Russian Export Reactor Capacities, 2008-2030	66
Figure 21. Russia Export Reactor Sales Forecasts, 2009-2030	69
Figure 22. RBMK Reactor Design	72
Figure 23. VVER-440 Reactor Design.....	73
Figure 24. VVER-1200 (AES-2006) Reactor Design.....	74
Figure 25. Beloyarsk 4 (BN-800) Construction in August 2007.....	76
Figure 26. KLT-40S Reactor Design	77
Figure 27. VVER-600 Reactor Main Systems Design.....	79
Figure 28. Reactor Design and Engineering Company Roles.....	81
Figure 29. Structure of Russian Energy Machine-Building Company	85
Figure 30. Steam Generator for Bushehr NPP Produced by ZiO-Podolsk	86
Figure 31. Structure of Russian Uranium Mining Industry.....	95
Figure 32. Operating and Planned Mines in Russia	96
Figure 33. Russia Domestic Uranium Requirements Forecasts, 2008-2030	106
Figure 34. Russian Export Reactor Uranium Requirements, 2008-2030	106
Figure 35. Projected Production of ARMZ to 2025.....	109
Figure 36. Uranium Mined in the Russian Federation, 2003-2007.....	110
Figure 37. ARMZ’s Uranium Reserves (tU).....	111
Figure 38. Uranium Reserves in Russia (Reasonably Assured Resources).....	111
Figure 39. Conversion Industry Product Flow in Russia	117
Figure 40. Production of UF ₆ in Russia Using Direct Method	119
Figure 41. Production of UF ₄ in Russia	120
Figure 42. Russia Domestic Conversion Requirements Forecasts, 2008-2030	123
Figure 43. Russian Export Reactor Conversion Requirements, 2008-2030	124
Figure 44. Timing for Centrifuge Development and Enrichment Capacity Growth	126
Figure 45. Russia’s Enrichment Industry Structure	128
Figure 46. Uranium Enrichment Facilities.....	130
Figure 47. Russian Centrifuges	131
Figure 48. Proposed Uranium Enrichment Complex at AECC.....	132
Figure 49. Russian Enrichment Capacity Allocation in 2008.....	134
Figure 50. European Tails on Route to Russia.....	134
Figure 51. 2007 TENEX Financial Results	136
Figure 52. Principle of HEU Reprocessing in the Russian Federation.....	138
Figure 53. Russia Domestic Enrichment Requirements Forecasts, 2008-2030	148
Figure 54. Russian Export Reactor Conversion Requirements, 2008-2030	149
Figure 55. 2007 Structure of OJSC TVEL	151
Figure 56. 2009 Structure of OJSC TVEL	152
Figure 57. TVS-2 Fuel Assembly.....	158
Figure 58. RBMK-1500 Fuel Assembly	161
Figure 59. Russia Domestic VVER Fabrication Requirements, 2008-2030.....	165
Figure 60. RBMK Fabrication Requirements, 2008-2030	165
Figure 61. Russian Export Reactor Fabrication Requirements, 2008-2030.....	166
Figure 62. Russia Uranium Supply and Demand Balance, 2008-2030.....	170
Figure 63. Russia Conversion Supply and Demand Balance, 2008-2030	171
Figure 64. Russia Enrichment Supply and Demand Balance, 2008-2030	172
Figure 65. Russia Fabrication Supply and Demand Balance, 2008-2030	173
Figure 66. Dry Storage SNF Facility at Mining and Chemical Combine	176

Figure 67. Closed Nuclear Fuel Cycle Planned at the Mining and Chemical Combine (“Mayak”)	180
Figure 68. Plans for Development: Mining and Chemical Combine.....	182
Figure 69. Supply of Enrichment to EU Utilities by Origin.....	195
Figure 70. Proposed Angarsk Uranium Enrichment Complex	211

List of Tables

Table 1. Russia’s Operating Nuclear Reactors	36
Table 2. Rosatom’s Reactor Investment Plan.....	41
Table 3. UxC High, Base, and Low Case Russia Reactor Unit Forecasts, 2008-2020	49
Table 4. UxC Forecast Cases for Russia’s Installed Nuclear Capacity, 2008-2020.....	50
Table 5. UxC Base Case New Reactor Projection for Russia, 2009-2030	51
Table 6. UxC New Reactor Construction Forecasts	53
Table 7. UxC Russia Reactor Market Size Forecasts.....	54
Table 8. Completed Soviet/Russian Nuclear Power Plants Abroad.....	55
Table 9. Suspended Soviet Nuclear Plant Projects Abroad.....	56
Table 10. Russia’s Current and Potential Nuclear Power Plant Export Projects	61
Table 11. Russian Export Reactor Unit Forecasts, 2008-2020.....	65
Table 12. Russian Export Reactor Nuclear Capacity Forecasts, 2008-2020.....	66
Table 13. UxC Base Case New Reactor Projection for Russian Export Units, 2009-2030	67
Table 14. UxC New Export Reactor Construction Forecasts.....	68
Table 15. UxC Russian Export Reactor Sales Forecasts	69
Table 16. ARMZ Mill/Production Center Summary	104
Table 17. ARMZ Mine/Project Summary.....	104
Table 18. Domestic Russian Uranium Requirements Forecasts	106
Table 19. Russian Export Reactor Uranium Requirements	106
Table 20. Russian Uranium Mining Investment Program, 2009-2015	108
Table 21. ARMZ Projected Production Based On Ownership Share.....	110
Table 22. Rosatom’s Investment Program for Conversion Complex by Type, 2009-2015.....	121
Table 23. Rosatom’s Modernization Investments by Facility, 2009-2015.....	121
Table 24. Domestic Russian Conversion Requirements Forecasts.....	124
Table 25. Russian Export Reactor Conversion Requirements.....	124
Table 26. Functions of Russian Enrichment Plants	133
Table 27. Nameplate Capacities of Russia’s Five Enrichment Facilities: 2008	133
Table 28. Facilities Involved in HEU Downblending and their Roles	139
Table 29. Rosatom Long-Term Investment Program for Enrichment Industry Modernization (2009-2015).....	141
Table 30. Federal Investment Program for Russian Enrichment Enterprises for 2007-2010 and up to 2015	142
Table 31. Domestic Russian Enrichment Requirements Forecasts.....	148
Table 32. Russian Export Reactor Conversion Requirements.....	149
Table 33. Current Russian Fuel Fabrication Capacity	154
Table 34. Domestic VVER Russian Fabrication Requirements Forecasts	165
Table 35. RBMK Fabrication Requirements Forecasts.....	166
Table 36. Russian Export Reactor Fabrication Requirements.....	166
Table 37. Russian Uranium Supply and Demand Balances, 2008-2020	170
Table 38. Russian Conversion Supply and Demand Balances, 2008-2020	171
Table 39. Russian Enrichment Supply and Demand Balances, 2008-2020	172
Table 40. Russian Fabrication Supply and Demand Balances, 2008-2020.....	173
Table 41. Decommissioning Schedule of Reactors in the Russian Federation	185
Table 42. Russian LEU Import Limits into the U.S. Under the Domenici Amendment	193
Table B-1. Timeline of the Russia’s Nuclear Industry, 1942-2009.....	232

1 – Introduction

The motivation for this study, *The Changing Geopolitics of the Nuclear Energy Market*, is to examine the dramatic shift that is taking place in the nuclear energy market from the standpoint of not only expected growth in nuclear capacity and demand for nuclear fuel, but also in terms of geography and international political considerations. Nuclear power is expected to grow rapidly in the East in order to meet the growing electricity needs in certain Eastern nations, and this creates associated demand for reactor components and nuclear fuel, impacting prices and supply availability.

It would be no exaggeration to say that Russia's nuclear industry has been going through "perestroika" – literally, restructuring. As a state-owned industry, nuclear followed (and continues to follow) Russia's ups and downs, and ups and downs again. The break-up of the Soviet Union was followed by a period of time that is often thought of as "the lost decade" in Russia. The new millennium gave a new start to Russia and its nuclear industry. The nuclear complex has always been considered a strategic industry in Russia and it has managed to survive more or less intact during the period of privatization, save for the nuclear equipment manufacturing sector.

Russia's newly found strength led to rethinking of the country's political and economic structure. As a reaction to this period of instability, order was sought. President Putin's solution was to build what he termed a "vertical vlasti" (power vertical), a top-down state structure that would be injected with some elements of private-sector-style corporate structure. Given this trend in state governance, it is no surprise that the nuclear industry followed a parallel path. The newly appointed head of Rosatom Sergei Kiriyenko's plan for "perestroika" amounted to, in effect, creating a modernized version of the former Soviet behemoth Minsredmash.

The structure of any branch of the civil nuclear industry in Russia consists (from the top down) of Rosatom, Atomenergoprom, and then the appropriate holding company for a branch under consideration. Grouping is important for such a structure, and the holding companies play a crucial role as they serve as an umbrella and a governing body for enterprises with similar missions. Examples include recently created Atomredmetzoloto (ARMZ), OJSC Separation-Sublimation Complex (RSK), and Khimpromengineering.

Consistent with the vertical structure, the goals to be achieved by the industry are set from the top and targets for the nuclear industry are formulated by the federal government in federal target programs. The federal targets have been translated into the industry program and a few sub-programs are in the process of development as well. The process of setting targets vaguely resembles the "five-year plans" that were characteristic of the economic planning in the Soviet Union. The effectiveness of the current target plans has yet to be proven. However, at least one positive result of creating such programs is that they lend clarity to the overarching goals of Russia's nu-

clear program. On the other hand, a federal mandate has several shortcomings. For example, the federal nuclear program has not been indexed to inflation or any cost increases, restricting payment to the amount put down on paper in 2006. This could potentially result in sub-contractors, some of which are private companies, under contract obliged to work at prices that are below cost, which is unsustainable.

The Complexities of Describing Russia's Nuclear Complex

Russia's nuclear enterprises do indeed form a unified complex. The industry is not simply an umbrella term for an aggregation of independent state-owned assets and companies; instead, the industry can be best represented by a flow chart of the nuclear fuel cycle: complete, inter-related, and co-dependent. It is for this reason that this study of the Russian nuclear complex could be nothing if not comprehensive.

An understanding of this unity and inter-relatedness is often underappreciated, but is critical to understanding Russia's nuclear industry. It is difficult to examine only one part of the nuclear chain without giving at least some attention to other parts. The connectedness of the nuclear complex did not significantly diminish with the fall of the Soviet Union, as Russia retained most of it on its territory. Not surprisingly, during the planning of the nuclear industry, all facilities of any importance were purposefully located in Russia – only the placement of uranium deposits, determined by nature, could not be centrally planned. Thus, the only sector that was appreciably impacted by the dissolution of the Soviet empire was uranium mining, though a fuel fabrication facility in Kazakhstan was lost as well. These losses were felt; in 2006, Sergei Kiriyyenko lamented the break-up and urged for the nuclear industries of Russia, Kazakhstan and Ukraine to be united yet once again into a single complex, bringing back the legacy of Minsredmash.

As of now, the Russian nuclear industry continues to be in a state of flux, positioning itself as a formidable, unified and efficient player in all the global nuclear markets. One cannot afford to ignore these changes and a failure to understand the current and future trends within the Russian nuclear program would, in fact, signify a failure to understand the nuclear marketplace altogether. This report provides comprehensive "A to Z" coverage of the nuclear industry in Russia while providing a significant level of detail, insight and analysis for each part of the nuclear fuel cycle.

Given this deep inter-relatedness and the continuing adjustments and retooling within Russia's nuclear complex, this report attempts to provide both a comprehensive vision of the industry and its future as well as independent explanations of each separate sector comprising the overall industry. Thus, the reader can choose to review the entire report from start to finish, or just single chapters of specific interest. Each chapter covering a separate part of Russia's nuclear industry can be viewed as a stand-alone discussion; however, it is naturally very important to realize the multitudinous relationships that each sector has with other parts of the industry. Thus, no part of this report can be truly detached from the rest, since no sector in Russia's large nuclear industrial complex can be detached from the others.

Organization of Report

This report starts with a review of the overall Russian nuclear power program, including both national and international trends as well as efforts to revamp the program, and then focuses in separate detailed sections on the specific aspects of Russia's nuclear power program. Following this Introduction, the report is organized as follows:

Chapter 2 – Country Overview provides an overview of Russia, including information on its geography, people, government, and economy. Additionally, this chapter discusses the position of the broader energy sector in Russia's economy and future.

In **Chapter 3 – Overview of Russia's Nuclear Industry**, the study reviews the history of nuclear power in Russia, and the latest facets of the restructuring of the industry, such as through the establishment of Rosatom and Atomenergoprom. This chapter also includes a detailed review of the domestic electric power sector and the impact of its restructuring on nuclear power prospects in Russia.

Chapter 4 – Russia's Domestic Nuclear Reactor Program examines the reactors that are now in operation, under construction, and planned in Russia. This chapter also covers UxC's latest forecast cases for Russian reactor development to 2030.

Russia is also a major player in the international reactor markets, and **Chapter 5 – Russia's Nuclear Power Plant Exports** analyzes Russia's current and future role in terms of nuclear power plant projects around the world. Along with Russian export reactor forecasts, the revenue potential for Russia is also examined.

Chapter 6 – Reactor Design and Construction looks at the history and future of Russian reactor designs, as well as Russia's large industrial complex that is dedicated to engineering, manufacturing, and construction for the nuclear reactor projects.

Chapter 7 – Uranium Mining Sector examines Russia's domestic uranium mining projects as well as its activities to procure U_3O_8 from international partners. This chapter also looks at the latest UxC forecasts for uranium fuel requirements from Russian domestic reactors as well as Russian export units through 2030.

Chapter 8 – Uranium Conversion Sector covers the second step in the front-end fuel cycle, with analysis of Russia's modernization efforts for its conversion facilities and how the requirements for UF_6 will fit into these plans.

Chapter 9 – Uranium Enrichment Sector analyzes Russia's supply of SWU and the latest in terms of Russia's enrichment technologies. A detailed discussion of the role of the HEU-LEU downblending program and how this fits into the enrichment supply picture in Russia is also included. Again, UxC's requirements forecasts for SWU from domestic and export units is included.

Chapter 10 – Fuel Fabrication Sector covers the various fuel fabrication facilities and companies involved in Russia. It also analyzes forecasts for VVER and RBMK fuel fabrication requirements domestically and abroad.

Chapter 11 – Russia’s Role in World Nuclear Fuel Markets ties together the preceding chapters and looks at Russia’s supply and demand balances in each fuel market and how this may allow for future Russian exports to additional countries.

Chapter 12 – Back-End of the Nuclear Fuel Cycle provides an overview of Russia’s reprocessing, MOX fuel, radioactive waste management, and decommissioning activities.

Chapter 13 – International Nuclear Trade looks at the role that various trade relations play in Russia’s nuclear sector, especially as it relates to Russia’s goals for expanded access to markets around the world.

Chapter 14 – Nuclear Nonproliferation Issues addresses the crucial role that Russia’s nuclear weapons program and disarmament efforts have played in shaping the civilian nuclear sectors. In addition, it examines the potential for some Russian initiatives to influence global nuclear nonproliferation goals.

Chapter 15 – Strategic Analysis and Potential Future Scenarios provides a look at key strengths that could help Russia’s nuclear program expand in the future along with potential hurdles that could hold back progress. It also offers broad predictions on the rate of Russia’s overall nuclear program expansion over the next two decades with three separate scenarios (realistic, optimistic, and pessimistic cases).

Chapter 16 – Conclusions offers the overall conclusions to this in-depth analysis of Russia’s nuclear power program and some final thoughts on its future.

In addition, there is a helpful **Glossary** as well as two appendices. **Appendix A** is a timeline of key events in Russia’s nuclear development, and **Appendix B** provides links to the websites of key Russian government organizations and companies (state-owned and private) that participate in the nation’s nuclear industry.

Work in Progress

It should be understood that this study of Russia’s situation is very much a work in progress. Constant changes are taking place in Russia in terms of demand, supply capacity, government and business structure. Along with providing information on Russia’s current nuclear reactor program, fuel cycle sector, as well as international trade and nonproliferation policies, the intention is for this report to give the reader a framework to view these changes as well as an indication of where things are headed in the future. In conjunction with the other reports in this *Geopolitics Series*, the aim is for the reader to gain an appreciation of the important ways that the nuclear energy markets are evolving, especially with much greater emphasis on growth in Eurasia. In addition to our *Geopolitical Series*, UxC is also expanding and enhancing coverage of the latest policy and related developments in key countries, such as Russia, through our *Policy Watch* briefing service.