RUSSIAN FEDERATION

Year of update: 2012

1. GENERAL INFORMATION

1.1. Country overview

1.1.1. Governmental System

The Russian Federation is a Presidential republic. The President is the head of state and is elected directly by the people. He controls all the three branches of power. The President can even dissolve the Duma, if he doesn't agree with its suggestions three times running. The President has his administration, but it is not part of the Federal Government. The President is involved in the work of the legislative and executive branches.

The Federal Assembly represents the legislative branch of power. It is comprised of the two houses, the Federation Council and the State Duma, which make laws. The Federal Assembly is also called the Parliament, but that is not its official name. Both chambers are headed by chairmen, sometimes called speakers. The Duma consists of 450 deputies (one half elected personally by the population, while the other half consists of deputies who are appointed by their parties after voting). The members of the Federation Council are elected on a different basis. There are two representatives of each subject of the RF (89 subjects). Every law must be approved by the State Duma and the Council of Federation and signed by the President. The President can veto laws passed by the Federal Assembly, but it can pass laws despite the President's veto with a two-thirds majority.

The Federal Government represents the executive branch of power. The President appoints its head, the Chairman of the Government, but the Duma must approve his appointment.

1.1.2. Geography and Climate

Russia is a large country occupying the eastern part of Europe and the northern part of Asia. In the north, the country is bounded by the Arctic Ocean, while Finland is its farthest northwest neighbour. In the west and southwest, the country is surrounded by the newly independent states, the former republics of the Soviet Union. In the south and southeast, Russia has a common border with Kazakhstan, Mongolia, China and North Korea. The eastern border of the country is the Pacific Ocean, where, Japan and the US state of Alaska are the nearest neighbours.

The total area of Russia is about 17,075 thousand km^2. The country consists of a large number of administrative units: regions (provinces) and republics. The regions of the country differ widely in territory, natural conditions, structure and national composition of the population, and economic development. The climate of country is marked by very wide regional variations. A significant part of north-eastern Russia falls within the Frigid Zone, while the Black Sea region has semitropical conditions.

Russia is abundant in energy resources of various kinds. The energy sector is a well-developed and important part of the national economy, producing about 10% of national Gross Domestic Product (GDP). In total, up to 95% of the country's energy consumption is met by fossil fuels. Despite its rich oil, gas and coal potential, Russia was one of the first countries to master nuclear energy for peaceful uses. In 1954, the Obninsk Nuclear Power Plant was commissioned and connected to the grid.

1.1.3. Population

According to the latest statistics, the population of Russia amounts to about 143 million (Table 1). The average population density is approximately 8.3 inhabitants/km^2. This number greatly varies throughout the country, from more than 100 inhabitants/km^2, for some regions in the European part of Russia, to less than one, for large territories in Siberia and the far northeast.

TABLE 1. POPULATION INFORMATION

						Average annual growth rate (%)
	1980	1990	2000	2005	2011	2000 to 2011
Population (millions)	137.4	148	145.9	143,5	143,1	-0,16
Population density (inhabitants/km²)	8.0	8.7	8.5	8,4	8,4	-0,1
Urban Population as % of total	69	74	73	72,9	73,9	0,1
Area (1,000 km²)	17,075.4					

Source: IAEA Energy and Economic Database,
Country Information, http://www.gks.ru/wps/wcm/connect/rosstat/rosstatsite.eng/

1.1.4. Economic Data

Russia has undergone significant changes since the collapse of the Soviet Union, moving from a globally-isolated, centrally-planned economy to a more market-based and globally-integrated economy. Economic reforms in the 1990s privatized most industry, with notable exceptions in the energy and defense-related sectors.

In 2011, Russia became the world's leading oil producer, surpassing Saudi Arabia. Russia is the second-largest producer of natural gas, and holds the world's largest natural gas reserves, the second-largest coal reserves and the eighth-largest crude oil reserves. Russia is the third-largest exporter of both steel and primary aluminum.

The historical data of Gross Domestic Product (GDP) values are presented in Table 2. Figure 1 shows the GDP structure in 2008.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

				Average annual growth rate (%)
	2000	2005	2010	2000 to 2010
GDP (billions of current US$)	973.0	1371	1479.31	4.73
GDP (billions of constant 2000 US$)	259.6	349.7	414.4	5.42
GDP per capita (thousands PPP*	8.807	12.123	15.807	7.65

US$/capita)				
GDP per capita (thousands of current US$/capita)	6.849	9.650	10.341	4.61

* PPP: Purchasing Power Parity
Source: Russia in figures, Country Information, Summary Statistical Transactions, http://www.gks.ru/wps/wcm/connect/rosstat/rosstatsite.eng/

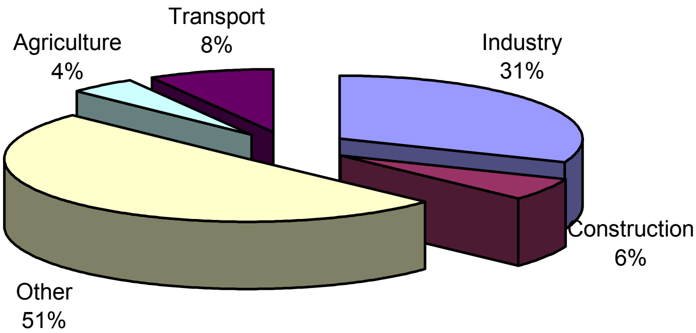

Fig.1. Gross Domestic Product structure in 2008

1.2. Energy Information

1.2.1. Estimated available energy

Energy reserves are shown in Table 3. Fossil fuels form the basis for the Russian energy sector.

TABLE 3. ESTIMATED ENERGY RESERVES

	Estimated available energy sources					
	Fossil Fuels			Nuclear	Renewable	Total
	Solid	Liquid	Gas	Uranium	Hydro	
Total amount in specific units*	157,01	10,8	33,1	1000000	16000	
Total amount in Exajoule (EJ)	4789	503.3	1274.1	157	57.6	6781

* Solid, Liquid: Million tons; Gas: Billion m^3; Uranium: Metric tons; Hydro, Renewable: TW h, for a period of 10 years.
Source: IAEA Energy and Economic Data Base; Country Information.

1.2.2. Energy Statistics

Table 4 gives the historical energy data. The share of nuclear energy in the energy supply is only 2%. Hydro energy is the only meaningful renewable energy resource in Russia. The share of hydro energy in the energy supply is also only 2%.

TABLE 4. ENERGY STATISTICS (EJ)

	1992	2000	2005	2006	2010	Average annual growth rate (%) 2000 to 2010
Energy consumption[1]						
- Total	34.4	27.8	31.2	32.5	32.75	1,62
- Solids[2]	7.7	5.24	5.32	5.32	4.35	-1,54
- Liquids	9.5	7.53	9.18	9.64	10.27	3,31
- Gases	14.5	13.19	14.63	15.38	16.79	2,48
- Nuclear	0.42	0.46	0.54	0.55	0.60	2,76
- Hydro	0.6	0.595	0.63	0.63	0.59	-0,07
- Other Renewables						
Energy production						
- Total	48.2	40.74	49.87	51.16	50.67	2,21
- Solids	7.8	5.6	6.5	6.74	6.99	2,25
- Liquids	16.7	13.6	19.7	20.11	21.27	5,12
- Gases	20.9	19.7	21.6	22.18	21.98	1.01
- Nuclear	0.42	0.46	0.54	0.55	0.60	2,76
- Hydro	0.6	0.595	0.63	0.63	0.59	-0,07
- Other Renewables						
Net import (Import - Export)						
- Total	-13.5	-13	-18.69	-18.7	-17.73	-3,30

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.
(2) Solid fuels include coal, lignite and commercial wood.
Source: IAEA Energy and Economic Database; Country Information.

1.2.3. Energy policy

The Energy policy of Russia is contained in an Energy Strategy document, which sets out policy for the period up to 2020. In 2000, the Russian government approved the main provisions of the Russian energy strategy to 2020, and in 2003, the new Russian energy strategy was confirmed by the government. The Energy Strategy document outlines several main priorities: an increase in energy efficiency, reducing impact on the environment, sustainable development, energy development and technological development, as well as improved effectiveness and competitiveness.

The aims of the structural policy of the energy sector for the next 10-15 years include:

- enhancement of the efficiency of natural gas utilization and an increase in its share of domestic consumption, especially in ecologically strained regions
- in-depth processing and comprehensive utilization of hydrocarbon raw materials
- enhancement of coal quality, as well as the stabilization of coal production volumes
- intensification of local and renewable energy resource development (hydro and wind power, peat, etc.)
- prioritizing electricity generation development, based on competitive and ecologically clean power plants

- safety and reliability enhancement of the first generation NPPs and development of new, advanced nuclear power plants

The new technological energy policy is oriented towards:

- radical enhancement of both the cost effectiveness and energy efficiency of all stages of the extraction, conversion, distribution, and utilization of energy resources
- effective decentralization of the energy supply
- ecological and accident safety, as well as the reliability of the energy supply
- development of qualitatively new technologies for the stable evolution of the power industry: ecologically clean coal-fired power plants, safe nuclear power plants, efficient processes for the utilization of new sources of power, etc.

Regional energy policy takes into account the existing principal differences in energy supply conditions and in the structures of the fuel resources of various parts of Russia. Regional energy self-governing and self-consistency is envisaged as a major challenge, i.e., the sustaining of the unified national energy sector through the development of federal energy systems, involving electricity, gas and oil supply networks.

1.3. The electricity system

1.3.1. Electricity policy and decision making process

Pricing and taxation constitute the core of the new energy policies. The liberalisation of oil, petroleum products and coal prices, which was undertaken in mid-1993, was not extended to the products of the so-called natural monopolies: natural gas, electric power, and heat from centralised sources. Prices for these energy sources are currently set by the federal regional government agencies responsible for the functions of the fuel and energy sector.

The creation of a competitive environment within the fuel and energy sector of the national economy will be directed towards reducing production costs and increasing the quality of energy-related services. This will be accomplished though industry denationalisation, primarily through the joint-stock companies.

A system of incentives and conditions for the conservation of energy, as well as the increase in energy production efficiency, is needed in order to realize Russia’s vast potential for energy conservation.

Economic policies will focus on the promotion of investment activities.

1.3.2. Structure of electric power sector

- **Transmission and Distribution Sector**

There are seven separate regional power systems in the Russian electricity sector: Northwest, Centre, Middle Volga, North Caucasus, Urals, Siberia, and Far East. The Far East region is the only one not connected to an integrated power system. Unified Energy System, which is 52% owned by the Russian government (Gazprom now has a 10% stake), controls most of the transmission and distribution in Russia. UES owns 96% of the transmission and distribution system, the central dispatch unit, and the federal wholesale electricity market (FOREM).

- **Unified Energy System**

The UNIFIED ENERGY SYSTEM of RUSSIA (UESR) is a unique system which creates significant economic benefits for both the Russian people and Russia's industry. The technical basis of UES of Russia is comprised of:

- 440 electric power stations with a total installed capacity of 219 thousand MW, including 23.2 thousand MW at nuclear power stations, which produced 1,016 billion kW·h of power in 2007
- a total of 3.018 million km of electric power lines
- a supply regulation system that physically unites all power installations with a single 50 Hz current frequency

The organisational basis of UES of Russia is comprised of:

- RAO UESR, which acts as a central locus that implements the functioning and development criteria established by the government, based on effectiveness, and provides operational supply management aimed at increasing economic efficiency at UESR
- 74 power suppliers that supply electric and heat power to consumers throughout the Russian Federation
- 34 large electric power stations that operate independently on the federal (national) wholesale electric power market
- over 300 organisations providing technological back up and development for UES of Russia, and which ensure the viability of the industry as a whole

- **Privatization and Electricity Market Reform**

The restructuring of Russia's power generation sector was completed in July 1, 2008, when state monopoly RAO UESR was dissolved. The country's transmission grid remained under state control. The reform has created a generating sector divided into multiple wholesale electricity companies (commonly called OGKs), which participate in a new competitive wholesale market.

The main participants of wholesale market are:

- Thermal wholesale generation companies (6)
- Atomic generation company
- Hydro generation company
- Other generation companies
- Federal grid company
- Trading operator
- System operator

- **Electricity Exports**

Russia exports significant quantities of electricity to the countries of the former Soviet Union, as well as to China, Poland, Turkey and Finland. UESR also has plans to export electricity to Iran, and possibly to Afghanistan and Pakistan, from two hydroelectric stations it is currently building in Tajikistan. There are currently two efforts underway to integrate the Russian and Western European electricity grids. UESR is participating in the Baltrel program, designed to create an energy ring of power companies in the Baltic States. The Union for the Coordination of Transmission of Electricity (UCTE), of which 20 European countries are members, has also entered into discussions with Russian colleagues over the technological and operational aspects of interconnecting their systems. Export electricity from Russia in 2011 equaled 23 billion kW·h.

1.3.3. Main indicators

Table 5 shows the historical electricity production data and installed capacities, and Table 6 the energy-related ratios.

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

	1970	1980	1990	2000	2005	2006	2011	Average annual growth rate (%) 2000 to 2011
Capacity of electrical plants (GWe)								
- Thermal	81.3	121.1	149.7	138.9	149.2	149.2	149.6	0,64
- Hydro	23.0	35.1	43.4	44.4	46.1	46.1	46.2	0,33
- Nuclear	0.8	9.2	20.2	21.2	23.2	23.2	25.3	1,61
- Wind								
- Geothermal								
- other renewable								
- Total	105.1	165.4	213.3	204.5	219	219	221.1	0,68
Electricity production (TW.h)								
- Thermal	373	622	797	568.5	629.2	664.1	705	2,10
- Hydro	94	129	167	165.4	174.4	175	163	0,1
- Nuclear	4	54	118	129	149.5	154.7	172.4	2,80
- Wind								
- Geothermal								
- other renewable								
- Total (1)	470	805	1082	877.8	953.1	995.6	1040,4	1,53
Total Electricity consumption (TW.h)	N/A	N/A	1073.8	863.7	939	962.5	1021	1,51

(1) Electricity transmission losses are not deducted.
Source: IAEA Energy and Economic Database; Russia in figures, Summary Statistical Transactions.

TABLE 6. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2005	2006	2010
Energy consumption per capita (GJ/capita)	160	250	260	190	214	228	230
Electricity consumption per capita (kW.h/capita)	N/A	N/A	7311	5915	6544	6740	7135
Electricity production/Energy production (%)	N/A	N/A	N/A	7,75	6,87	7,01	8,61
Nuclear/Total electricity (%)	0.74	6.71	10.91	15	15,7	15,7	16,6
Ratio of external dependency (%) (1)	N/A	N/A	N/A	-48,1	-60	-58	-53

(1) Net import/Total energy consumption
Source: IAEA Energy and Economic Database; Russia in figures, Summary Statistical Transactions.

2. NUCLEAR POWER SITUATION

2.1. Historical Development and current nuclear power organizational structure

2.1.1. Overview

1937	Commencement of active experimental studies on the structure of atomic nuclei. Production of “pulse” amount of neptunium and plutonium in Leningrad Radium Institute.
1939	Start of research into the feasibility of achieving a nuclear chain reaction. Installation of the largest cyclotron in Europe in the Leningrad Physical and Technical Institute.
1940	Discovery of phenomenon of spontaneous nuclear fission in uranium. Theoretical demonstration by Soviet scientists of the feasibility of energy release from a uranium nuclear fission chain reaction.
1942	Recommencement of work on the atomic problem interrupted by the outbreak of the war.
1943	Creation of a special physics laboratory - the No. 2 Laboratory in Moscow (now the Russian Scientific Centre “Kurchatov Institute”).
1945	Establishment of a governmental interdepartmental body - the First Chief Administration to coordinate all work in the field of atomic science and technology.
1945/46	Technology mastering and organization of the production of metallic uranium and high-purity reactor graphite in order to start up the first experimental reactor.
1946	Achievement of a controlled uranium fission chain reaction at the No. 2 Laboratory.
1948	Start up of the first industrial nuclear reactor.
1949	Testing of the Soviet Union’s first atomic bomb.
1953	Establishment of the USSR Ministry of Medium Machine Building as the authority dealing with nuclear science and technology.
1954	Start up of the world’s first nuclear power plant in Obninsk.
1957	Ratification of the Charter of IAEA by the USSR.
1964	Commissioning of the first commercial water-moderated, water-cooled vessel-type (WWER) reactor at Novo-Voronezh. Commissioning of the first commercial boiling water-cooled graphite moderated reactor with nuclear superheating of the steam at Beloyarsk.
1970	Establishment of the International Nuclear Information System (INIS) with the active participation of the USSR.
1973	Commissioning of the first commercial water-cooled graphite-moderated channel-type (RBMK) reactor at Leningrad.
1973	Commissioning of the world’s first prototype-scale fast breeder reactor (BN-350) in Aktau for electricity generation and desalinated water production.
1976	Completion of the first nuclear central heating and power plant at Bilibino, in the far northeastern part of Russia.
1977	Start up of the RT-1 plant for reprocessing of spent nuclear fuel.
1980	Start up of a commercial power-generating unit powered by BN-600 fast reactor at Beloyarsk. Commissioning of the 1000 MW(e) water moderated, water-cooled reactor (WWER-1000).
1984/86	Commissioning of the Zaporozhie and Balakovo NPPs with WWER-1000 serial reactors with full compliance to the new safety regulation.
1986	Accident at unit 4 of Chernobyl NPP. Ministry for Atomic Energy is organized to be responsible for Nuclear Power Plants operation.

1989	Reorganization of the Ministry of Medium Machine Building and Ministry for Atomic Energy as the USSR Ministry of Atomic Energy and Industry.
1992	Establishment of Ministry for Atomic Energy of the Russian Federation (Minatom of Russia, also known as Ministry for Nuclear Power), which replaced the USSR Ministry of Atomic Energy and Industry.
1993	President Yeltsin and President Bush sign SALT-2 Agreement, according to which the strategic offensive weapons should be reduced and limited over 7 years. Beginning of conversion of the Russian weapons-grade highly-enriched uranium (VOU) in compliance with the Russian-US Agreement on nuclear disarmament.
1994	The Russian Federation Government makes decision to cease production of weapons-grade plutonium.
1995	50^{th} anniversary of the nuclear power industry of Russia. Beginning of commercial conversion of highly-enriched uranium into low-enriched uranium (the VOU-NOU project) at the Ural Electrochemical Combine (Novouralsk town, Sverdlovsk Region). The FEI RF SSC, Obninsk, Kaluga Region, puts into service the first phase of the Laser and Nuclear Center for nuclei fission energy direct-conversion into laser radiation. The first phase of the diamond production is put into service at the VNIIEF RF NC as part of the conversion program.
1996	Approval of programs for support of the industry’s major schools of thought. Sea trials of PETR VELIKY nuclear-powered cruiser are completed. Completion of the removal of the Soviet Nuclear weapons to be disassembled from the CIS countries to Russia.
1997	Beginning of batch production of a news header type of munitions for the SRF TOPOL-M missile complex.
1998	Decision-making on production of the first batch of pilot uranium-plutonium fuel assemblies. Fabrication of a pilot batch of ADE-2, -4, -5 reactor conversion fuel rods. Approval of the program to develop nuclear power engineering of the Russian Federation from 1998 to 2005 and to 2010. Activities to elaborate a draft “Strategy for Nuclear Power Development” (a 50 year forecast) are started.
1998	Process to fabricate weapons-grade plutonium base mixed fuel is devised and brought into commercial practice at the Research Institute of Nuclear Reactors State Research Center of the Russian Federation. A pilot batch of that fuel for BOR-60 and BN-600 reactors is fabricated.
1998	Establishment of the Information and Analytical Center of Minatom of Russia to ensure information and analytical support of the Ministry administration and of the Industry Emergency Commission, both under normal operation and in case of emergency at the industry enterprises.
1999	Commissioning of the Kursk NPP 2 power unit, upon completion of overhaul, with monitoring of all fuel channels and with their partial substitution according to the check results. That work is carried out in the industry for the first time.
1999	Start of implementation of wide-scale measures to accelerate utilization of nuclear-powered submarines removed from military service and to accelerate ecological recovery of sites of dangerous installation sites belonging to the Ministry of Defense, handed over to Minatom of Russia in compliance with the decision of the Government of the Russian Federation.

1999	50th anniversary of the nuclear weapons of Russia. The nuclear weapon system is now a model of Research and Development Associations, with the worldwide significance of high-capacity pilot-scale productions enabling it to tackle large-scale high-technology problems.
2001	Putting into operation of the first unit of the Volgodonsk (Rostov) NPP.
2002	25th anniversary of the putting into operation of PT-1 plant at " MAYAK" Production.
2004	Nuclear Power of Russia - 50 Years of History. On June 27, 1954, in the city of Obninsk, a nuclear power plant of the capacity 5,000 kW was put into operation and connected to the grid for the first time in the world's history.
2005	60 Years of Nuclear power in Russia. Nuclear Power of Russia dates from 20 August, 1945, when First General Directorate was established.
2007	Russian President Vladimir Putin ratifies the new law on Rosatom state corporation.
2009	On 30 October, the 'cold and hot' pre-commissioning testing of reactor adjustment work is successfully completed at the second unit of the Rostov NPP.
December 10, 2010	Rostov NPP: Rosatom signs a permit for putting power unit No. 2 into operation.
27 February 2012	Baltic NPP: Construction of the nuclear island foundation has started

2.1.2. Current organizational chart(s)

Figure 2 shows the structure of the nuclear industry in Russia.

*Fig. 2. Structure of Nuclear Industry in Russia (*http://atomenergoprom.ru/en/nuclear/sheme/*)*

Atomenergoprom is part of Rosatom State Nuclear Power Corporation. Atomenergoprom produces a wide range of nuclear and non-nuclear products, as well as providing full service in the area of nuclear power engineering. In particular, the company provides design and turn-key construction of a nuclear power plant, fuel supplies for the whole operation life of N-plant, upgrading and maintenance, as well as personnel training. The company structure consists of divisions formed according to the basic segments of the nuclear fuel cycle:

- uranium production
- uranium conversion and enrichment
- nuclear fuel production
- nuclear and power machine engineering
- design, engineering and construction of nuclear power plants
- power generation at nuclear power plants

In addition, Atomenergoprom's structure includes enterprises offering products and services in the following areas:

- nuclear power plant maintenance and upgrading

- nuclear power plant personnel training
- isotopes
- scientific and research companies and design offices
- non-nuclear products and services

2.2. Nuclear power plants: Overview

2.2.1. Status and performance of nuclear power plants

Figure 3 shows the map of Russian nuclear power plants. Table 7 shows the current status of Russia's nuclear power plants.

Russia's nuclear plants, with 33 operating reactors totaling 25,3 MWe, comprise:

- 4 first generation VVER-440-similar pressurized water reactors,
- 2 second generation VVER-440 pressurized water reactors,
- 11 third generation VVER-1000 pressurized water reactors with a full containment structure, mostly V-320 types,
- 11 RBMK light water graphite reactors now unique to Russia. The four oldest of these were commissioned in the 1970s at Kursk and Leningrad, and are of some concern to the Western world. A further Kursk unit is under construction.
- 4 small graphite-moderated BWR reactors in eastern Siberia constructed in the 1970s for cogeneration (EGP-6 models on linked map).
- One BN-600 fast-breeder reactor.

Fig. 3. Map of Russian Nuclear Power Plants

TABLE 7. STATUS OF NUCLEAR POWER PLANTS

Station	Type	Net Capacity	Operator	Status	Reactor Supplier	Construction Date+	Grid Date++	Commercial Date	Shutdown Date	UCF* for year 2011
BALAKOVO-1	WWER	950	REA	Operational	MNE	01-Dec-80	28-Dec-85	23-May-86		89.8
BALAKOVO-2	WWER	950	REA	Operational	MNE	01-Aug-81	08-Oct-87	18-Jan-88		87.6
BALAKOVO-3	WWER	950	REA	Operational	MNE	01-Nov-82	25-Dec-88	08-Apr-89		103.1
BALAKOVO-4	WWER	950	REA	Operational	MNE	01-Apr-84	11-Apr-93	22-Dec-93		91.6
BELOYARSKY-3	FBR	560	REA	Operational	MNE	01-Jan-69	08-Apr-80	01-Nov-81		80.9
BILIBINO UNIT A	LWGR	11	REA	Operational	MNE	01-Jan-70	12-Jan-74	01-Apr-74		39.6
BILIBINO UNIT B	LWGR	11	REA	Operational	MNE	01-Jan-70	30-Dec-74	01-Feb-75		22.5
BILIBINO UNIT C	LWGR	11	REA	Operational	MNE	01-Jan-70	22-Dec-75	01-Feb-76		23.0
BILIBINO UNIT D	LWGR	11	REA	Operational	MNE	01-Jan-70	27-Dec-76	01-Jan-77		34.0
KALININ-1	WWER	950	REA	Operational	MNE	01-Feb-77	09-May-84	12-Jun-85		90.3
KALININ-2	WWER	950	REA	Operational	MNE	01-Feb-82	03-Dec-86	03-Mar-87		91.0
KALININ-3	WWER	950	REA	Operational	MNE	1985/10/01	2004/12/16	2005/11/08		85.2
KALININ-4	WWER	950	REA	Under Constr	MNE	1986/08/01	2010/12/31	2011/11/24		
KOLA-1	WWER	411	REA	Operational	MNE	01-May-70	29-Jun-73	28-Dec-73		68.5
KOLA-2	WWER	411	REA	Operational	MNE	01-Jan-73	09-Dec-74	21-Feb-75		69.5
KOLA-3	WWER	411	REA	Operational	MNE	01-Apr-77	24-Mar-81	03-Dec-82		63.6
KOLA-4	WWER	411	REA	Operational	MNE	01-Aug-76	11-Oct-84	06-Dec-84		71.1
KURSK-1	LWGR	925	REA	Operational	MNE	01-Jun-72	19-Dec-76	12-Oct-77		94.5
KURSK-2	LWGR	925	REA	Operational	MNE	01-Jan-73	28-Jan-79	17-Aug-79		78.6
KURSK-3	LWGR	925	REA	Operational	MNE	01-Apr-78	17-Oct-83	30-Mar-84		93.5
KURSK-4	LWGR	925	REA	Operational	MNE	01-May-81	02-Dec-85	05-Feb-86		67.9
LENINGRAD-1	LWGR	925	REA	Operational	MNE	01-Mar-70	21-Dec-73	01-Nov-74		58.8
LENINGRAD-2	LWGR	925	REA	Operational	MNE	01-Jun-70	11-Jul-75	11-Feb-76		95.7
LENINGRAD-3	LWGR	925	REA	Operational	MNE	01-Dec-73	07-Dec-79	29-Jun-80		84.0
LENINGRAD-4	LWGR	925	REA	Operational	MNE	01-Feb-75	09-Feb-81	29-Aug-81		81.3
NOVOVORONEZH-3	WWER	385	REA	Operational	MNE	01-Jul-67	27-Dec-71	29-Jun-72		88.1
NOVOVORONEZH-4	WWER	385	REA	Operational	MNE	01-Jul-67	28-Dec-72	24-Mar-73		80.3
NOVOVORONEZH-5	WWER	950	REA	Operational	MNE	01-Mar-74	31-May-80	20-Feb-81		25.1
SMOLENSK-1	LWGR	925	REA	Operational	MNE	01-Oct-75	09-Dec-82	30-Sep-83		67.2
SMOLENSK-2	LWGR	925	REA	Operational	MNE	01-Jun-76	31-May-85	02-Jul-85		90.4
SMOLENSK-3	LWGR	925	REA	Operational	MNE	01-May-84	17-Jan-90	30-Jan-90		77.0
KURSK-5	LWGR	925	REA	Under Constr.	MNE	01-Dec-85				
SOUTH URALS 2	FBR	750	REA	Under Constr.	MNE	01-Jan-93				
BILIBINO E	LWGR	31	REA	Planned						
BILIBINO F	LWGR	31	REA	Planned						

BILIBINO G	LWGR	31	REA	Planned						
BN-1600	FBR	1500	REA	Planned						
SOUTH URALS 3	FBR	750	REA	Planned						
BELOYARSKY-1	LWGR	102	REA	Shut Down		01-Jun-58	26-Apr-64	26-Apr-64	01-Jan-83	
BELOYARSKY-2	LWGR	146	REA	Shut Down		01-Jan-62	29-Dec-67	01-Dec-69	01-Jan-90	
NOVOVORONEZH-1	WWER	197	REA	Shut Down		01-Jul-57	30-Sep-64	31-Dec-64	16-Feb-88	
NOVOVORONEZH-2	WWER	336	REA	Shut Down		01-Jul-64	27-Dec-69	14-Apr-70	29-Aug-90	
VOLGODONSK-1	WWER	950	REA	Operational.		1981/09/01	2001/03/30	2001/12/25		92.5
VOLGODONSK-2	WWER	950	REA	Operational		1983/05/01	2010/03/18	2010/12/10		88.6

* UCF (Unit Capability Factor) for the latest available year (only applicable to reactors in operation).
+ Date, when first major placing of concrete, usually for the base mat of the reactor building is done.
++ Date of the first connection to the grid
Source: Russian nuclear power plants, Rosenergoatom, Moscow (2009), http://www.rosenergoatom.ru/ .
PRIS database (www.iaea.org/pris).

Performance of NPPs

In 2011, the nuclear power plants of Russia generated 172.7 billion kWh – 106% of the index of 2010

The NPPs of Russia fulfilled 101% of the plan.

The capacity factor made up 81.2% – 1% more than in 2010.

Only one INES incident of level 1 (not dangerous for population) was registered at Russia's NPPs, in 2011.

The radiation situation at the NPPs and in their nearby areas is within norms.

Table 7A shows the operational facts of the NPPs in 2011.

TABLE 7A. STATUS OF NUCLEAR POWER PLANTS – OPERATIONAL FACTS IN 2011

NPP	Capacity Installed (MW(e))	lectricity Generation (10^6 kW·h)	Load Factor (%)
Balakovo	4,000	32 417,5	92,5
Kalinin	3,000	23 441,9	88,6
Kola	1,760	10 554,5	68,5
Novovoronezh	1,834	8 396,2	52,3
Beloyarsk	600	4 249,8	80,9
Bilibino	48	153,1	36,5
Kursk	4,000	29 035,5	82,9
Leningrad	4,000	28 107,8	80,2
Smolensk	3,000	20 521,3	78,1
Volgodonsk	2,000	15 803,7	90,2
Total	24,242	172 681,3	81,2

Source: Country Information, *PRIS database http://www.iaea.org/programmes/a2/*

2.2.2. Plant upgrading, plant life management and license renewals

The lifetime-extension activities at the operation units of NPPs were initiated pursuant to the program of development of the nuclear power industry in the Russian Federation in 1998-2005, and in the period up to 2010, approved by the RF Government Decree № 815 of 21.07.1998. The long-term program of activities of the Rosatom state atomic energy corporation for the period 2009-2015, approved by RF Government Decree № 705 of 20.09.2008, calls for lifetime extension of operational nuclear power units. As of 2011, lifetime-extension projects were accomplished for the following 15 power units with the total rate power of 8,362 MW: Novovoronezh NPP Units 3 and 4 (VVR-440), Kola NPP Units 1 and 2 (VVR-440), Leningrad NPP Units 1-4 (RBMK-100), Kursk NPP Units 1 and 2 (RBMK-100), Bilibino NPP Units 1-4 (EGP-6) and Beloyarsk NPP Unit 3 (BN-600).

As a result of the accomplished large-scale renovation, safety performance of these units increased substantially, having reached the levels consistent with the applicable requirements of domestic regulatory documents (OPB 88/97) and IAEA recommendations for NPPs built to earlier standards. The possibility for safe operation of the 15 units beyond the originally-assigned lifetimes (for over 15 additional years) has been demonstrated. Long-term operating licenses were properly obtained from Rostekhnadzor, allowing operation of the units beyond the originally assigned lifetime. Based on the modern level of knowledge and regulatory requirements, the 15 year additional operation period is justified in terms of the residual life of the critical components (reactor vessel for VVER units and graphite stock for RBMK units). The results of assessments of the economic efficiency of the NPP power unit lifetime extension projects are indicative of their commercial viability and of high returns on investments. Implementation of such projects is quite an efficient financial investment, provided that unconditional priority is given to ensuring the safety of such units during the extended period of operation.

2.3. Future development of Nuclear Power

2.3.1. Nuclear power development strategy

Rosatom's initial proposal for a rapid expansion of nuclear capacity was based on the cost effectiveness of completing the 9 GWe of then partially-built plants. To get the funds, Rosatom offered Gazprom the opportunity to invest in some of the partly-completed nuclear plants. The argument was that the US$ 7.3 billion required for the whole 10 GWe (including the just-completed Rostov 1) would be quickly recouped from gas exports if the new nuclear plant reduced the need to burn that gas domestically. In September 2006, Rosatom announced a target of nuclear power plants providing 23% of electricity by 2020, thus commissioning two 1,200 MWe plants per year from 2011 to 2014, and then three per year until 2020. In July 2009, a revised federal target program (FTP) for 2010-2015 and until 2020 was approved and signed by the President. Projected federal budget funding was reduced to RUR 110 billion ($3.5 billion), for 2010. The FTP program envisages a 25-30% nuclear share in electricity supply by 2030, 45-50% in 2050 and 70-80% by the end of century.

TABLE 8. PLANNED NUCLEAR POWER PLANTS

Station/Project Name	Type	Capacity MWe	Expected Construction Start Year	Expected Commercial Year
Kalinin 4	V-320	1000	Const	2011
Kursk 5	RBMK	1000	Const	indefinite
Vilyuchinsk	KLT-40S	40 x 2	Const 5/09	2014
Beloyarsk 4	BN-800 FBR	880	Const	2014
Novovoronezh II -1	VVER 1200/ V-392M	1200	Const 6/08	2014
Leningrad II-1	VVER 1200/ V-491	1200	Const 10/08	2013
Novovoronezh II -2	VVER 1200/ V-392M	1200	Const 7/09	2016
Rostov 3	VVER 1000/ V-320	1100	Planned 2009	2014
Leningrad II -2	VVER 1200	1200	Planned 2009	2014
Rostov 4	VVER 1000/ V-320	1100	Planned 2010	2016
Baltic 1 (Kaliningrad)	VVER 1200	1200	Planned 2010	2016
Leningrad II -3	VVER 1200	1200	Planned 2011	2017
Leningrad II -4	VVER 1200	1200	Planned 2014	2019
Baltic 2 (Kaliningrad)	VVER 1200	1200	Planned 2012	2018

VVER-1200 is the reactor portion of the AES-2006 nuclear power plant. Rostov is also known as Volgodonsk. South Urals was to be BN-800, and may revert.

2.3.2. Project management

The FTP program is based on VVER technology, at least until roughly 2030. It highlights the goal of moving to fast neutron reactors and a closed fuel cycle, for which Rosatom proposed two options. The first is to select a fast neutron reactor with lead coolant as the basic technology, and to mobilize all available resources for this exclusively. This is expected to cost RUR 110 billion, mostly from the federal budget. The second option also provides for development of fast neutron reactors, cooled by sodium and lead-bismuth, with the related engineering designs of such reactors and closed fuel cycle technologies to be in place no later than 2014. A detailed design should be developed for the construction of a multi-purpose fast neutron research reactor (MBIR) by then also. This second option is designed to attract more funds aside from the federal budget allocation, and is the option favored by Rosatom.

2.3.3. Project funding

In mid-2009, the Russian government said that it would provide more than RUR 120 billion (about US$3.89 billion) over 2010 to 2012 for a new program devoted to R&D on the next generation of nuclear power plants. It identified three priorities for the nuclear industry: improving the performance of light water reactors over the next two or three years, developing a closed fuel cycle based on deployment of fast reactors in the medium term, and developing nuclear fusion over the long term.

In February 2010, the government announced that Rosenergoatom's investment program for 2010 amounted to RUR 163.3 billion, of which RUR 53 billion would come from the federal budget. Of the total cost, RUR 101.7 billion is for nuclear plant construction, almost half of which is to come from Rosenergoatom's funds. It includes the reactors listed below as under construction, as well as Leningrad II-2 and the Baltic plant. In March, Rosatom said that it now intended to commission three new reactors per year from 2016.

In March 2011, the State Duma's energy committee recommended construction of Kursk II with standard VVER-TOI reactors and the updating of FTP plans to have Units 1 and 2 put on line in 2020 and 2023. Rosatom was told start engineering surveys for Kursk II in 2011. The committee has said that unit 1 must be in service by the time the first RBMK unit of phase I is closed, in order to ensure adequate supply to Moscow.

2.3.4. Electric grid development

The Russian power grid is the world's largest highly-automated complex to generate, transmit, and distribute electric power, and also to control these processes on a day-to-day basis. The power industry in Russia developed stepwise, by incorporating regional power systems, working in parallel, and forming interregional electric power pools, which merged to form a single power grid. The nation's power grid started to evolve as soon as the GOELRO plan was launched. Russia's power grid is the main component of the national power industry, and is a complex network of power plants and mains, all of which share the same operating mode and centralized dispatching control. The transition to this form of organization of the power industry has made it possible to make the most of power resources and to raise the economy and reliability of energy supply for both economy and population.

The control of this immense, synchronously-operating system, which reaches 7,000 km west to east and over 3,000 km north to south, is a very complex engineering task with no analogs anywhere in the world. During more than 40 years in operation, the Russian power grid has accumulated a wealth of experience in the reliable and efficient supply of quality energy to users. Of the 74 total power networks, the power grid of Russia comprises 69. Of the seven Integrated Power Systems (IPSs), six work in parallel as part of the power grid: the Center, Middle Volga, Urals, Northwest, North Caucasus, and Siberia IPSs. The East IPS operates separately from the Siberia IPS. Working in parallel with the Russian power grid are the power systems of Kazakhstan, Ukraine, Moldavia, Belarus, Estonia, Latvia, Lithuania, Azerbaijan, Georgia, and, through the insertion of direct current, the power system of Finland.

2.3.5. Site selection

Placement of nuclear power plants in Russia is performed in accordance with the resolution of the Government of the Russian Federation on October 17, 2009, № 823 "On schemes for long-term development of electric power". The basic principles of the schemes and programs for long-term electric power development are:

- efficiency
- application of new technological solutions
- coordination of schemes and programs of long-term development of electric power and the subjects of electricity
- publicity and openness of public investment strategies and solutions

Conditions considered unfavorable for the placement of an NPP include territory of active volcanoes and territory exposed to tsunamis, floods and catastrophic floods.

2.4. Organizations involved in construction of NPPs

Architect engineers:

- All-Russia Scientific Research and Design Institute of Power Technology (VNIPIET), St. Petersburg
- Institute “Atomenergoproekt” (AEP), and its branches in Moscow, St. Petersburg, Nizhny Novgorod
- State Institute of Construction and Design (GSPI), Moscow

NSS main suppliers:

- "Atommash", an open-end joint stock company - NSS WWER-1000, BN and AST, Volgodonsk
- “Izhorskie zavody”, an open-end joint stock company - NSS WWER-1000 and WWER-440, St. Petersburg

Main component suppliers:

- “Leningradskiy metallicheskiy zavod”, an open-end joint stock company - turbines for NPPs, St. Petersburg
- “Podolskiy mashinostroitelniy zavod”,, an open-end joint stock company - steam generators, separators, piping, etc., Podolsk

2.5. Organizations involved in operation of NPPs

State enterprise “Russian state concern for generation of electric and thermal power at nuclear power plants” [“ROSENERGOATOM”] was founded in 1992, and up until 2002 executed centralized state management for 8 of the 9 Russian nuclear power plants. From April 1, 2002, "ROSENERGOATOM" was transformed into a generating company with a common rate. 10 NPPs were joined to it as junior branches, including Leningrad NPP and Volgodonsk NPP, which was commissioned in December 2001.

All NPPs have 33 energy units with a total rated power of 25.2 GW_e. According to Russian federal laws in the area of atomic energy, "ROSENERGOATOM" performs the functions of the NPP operating utility and bears complete responsibility for maintaining nuclear and radiological safety at all stages of NPP operation including measures on the elimination of nuclear accident consequences.
The ultimate goal of "ROSENERGOATOM" activities is to ensure the safe operation of Russian nuclear power plants.

*"**ROSENERGOATOM**" IS ENTRUSTED TO PERFORM THE FOLLOWING MAIN FUNCTIONS:*

Ensuring the NPP safe operation, namely:

- development and implementation of NPP safety culture
- performance of continuous surveillance over NPP safety
- collection and analysis of the information on NPP accidents, equipment failures and human error for the development of corrective measures
- management of physical protection and fire prevention at nuclear power plants
- development and management of emergency preparedness plans

Support of NPP operation, namely:

- providing nuclear power plants with necessary material and technical resources
- development and performance control for the measures aimed at enhancement of NPP reliability, quality and safe operation
- development of normative documentation and scientific support of NPP operation and of operation licensing
- operating personnel recruiting, initial and continuous training
- international activities
- legal support

Nuclear power development, namely:

- development and implementation of NPP erection and commissioning programs
- modernization and upgrading of the operating nuclear power plants
- resolution of the problems regarding lifetime extension of the operating nuclear power plants
- design & development activities and NPP construction licensing
- participation in resolution of social issues concerning nuclear industry employees
- providing the general public with information on the issues of NPP ecological safety

2.6. Organizations involved in decommissioning of NPPs

The main organization involved in the decommissioning process of NPPs is ROSENERGOATOM.

Table 9. Reactors in decommissioning process or decommissioned

Reactor name	Shut down date	Shutdown reason	Decom. Strategy	Current decom. Phase	Current Fuel managemt phase	Decom. Licensee	License terminate
APS-1	2002/04/29	Lifetime expiration	Long Term Shutdown	Permanent Shutdown	Storage	ROSATOM	N/A
BELOYARSKY-1	1983/01/01	Lifetime expiration	Long Term Shutdown	Permanent Shutdown	Storage	ROSATOM	N/A
BELOYARSKY-2	1990/01/01	Lifetime expiration	Long Term Shutdown	Permanent Shutdown	Storage	ROSATOM	N/A
NOVOVORONEZH-1	1988/02/16	Lifetime expiration	Long Term Shutdown	Permanent Shutdown	Storage	ROSATOM	N/A

NOVOVORONEZH-2	1990/08/29	Lifetime expiration	Long Term Shutdown	Permanent Shutdown	Storage	ROSATOM	N/A

Source : *PRIS database*, *http://www.iaea.org/programmes/a2/*

2.7. Fuel cycle including waste management

The Russian Federation has capabilities in all stages of the nuclear fuel cycle. The excess capacities are offered to foreign utilities on a commercial basis. Parts of the Nuclear Fuel Cycle Facilities are State-owned (Rosatom), while the other parts are managed by joint stock companies (TVEL, Rosenergoatom, Atomstroi, etc.), in which controlling interests are retained by the State.

Uranium mining and milling

The Priargunsky Industrial Mining and Chemical Union has an annual capacity of 3,500 t U using open pit, underground and ISL extraction methods. This facility is operated by JSC TVEL.

Uranium conversion

Rosatom operates Angarsk and Tomsk conversion plants (conversion to UF_6), which have a total annual capacity of 30,000 t U. The excess capacities are offered to foreign utilities on a commercial basis.

Enrichment process

The first civil uranium enrichment plant in the Russian Federation started operation in 1964, at Ekaterenburg. Three more plants came into operation later at Tomsk, Angarsk and Krasnoyarsk. At present, Rosatom operates all four plants, which have a total annual capacity of 15,000 t SWU. The excess capacities are offered to foreign utilities on a commercial basis.

Fuel fabrication

Nuclear fuel fabrication is carried out by JSL TVEL at two plants,Electrostal and Novosibirsk. Electrostal produces fuel elements, assemblies, powder and pellets for WWER 440, WWER 100, BN 600, RBMK and PWR reactors. The Novosibirsk plant manufactures fuel elements and assemblies for WWER 1000 reactors. In the production of fuel assemblies for RBMK and WWER 1000 reactors, a quantity of fuel pellets is supplied from the Ust Kamenogorsk plant (Kazahstan). However, new lines for powder and pellet production at the Novosibirsk plant started operation in 2000-2002. Zirconium production of JSC TVEL, for nuclear fuel fabrication capacity (fuel assemblies for different reactor types), is about 2600 t HM/a (ton of heavy metal per year). The excess capacities are offered to foreign utilities on a commercial basis.

Reprocessing

The reprocessing option is the chosen method for dealing with spent reactor fuel, with the exception of spent fuel originating from RBMKs, which should be disposed of. Rosatom operates the RT-1 Plant in Chelyabinsk for reprocessing fuel from WWER plants' capacity for WWER 440 fuel is 400 t HM/a. The construction of a second reprocessing plant (RT-2) at Krasnoyarsk, which has a first line design capacity of 800 t HM/a, has been postponed indefinitely. Reprocessed uranium is used for RBMK fuel production. Plutonium obtained at RT-1 is temporarily stored on-site in dioxide form. Rosatom operates several wet AFR fuel storage facilities at RT-1 and RT-2, and at several nuclear power plants, with a total capacity of about 16,000 t HM/a.

2.8. Research and development

2.8.1. R&D Organizations and Institutes

Fundamental Research

- Institute of Theoretical and Experimental Physics, Moscow
- Institute of High Energy Physics, Protvino
- Institute of Innovation and Thermonuclear Research, Troitsk

These are major nuclear industry research centres that carry out extensive fundamental theoretical and experimental investigations into the properties of the atomic nucleus and elementary particles, plasma and laser physics, thermonuclear fusion, development of new types of accelerator and reactor technology, and into developing equipment and facilities for physical research.

Applied Research and Development (R&D)

- The Russian Scientific Centre (RSC) “Kurchatov Institute”, Moscow
- The State Scientific Centre “Institute of Physics and Power Engineering” (SSC FEI), Obninsk
- The State Scientific Centre "All-Russian Inorganic Materials Research Institute" (SSC VNIINM), Moscow
- The State Scientific Centre Nuclear Reactor Research Institute (SSC NIIAR), Dimitrovgrad
- Research and Development Institute of Power Engineering (NIKIET), Moscow

These are all major scientific centres in the field of nuclear science and technology. Theoretical and experimental research, performed at these institutes on nuclear and particle physics, neutron physics, thermophysics, hydraulics, material science and nuclear safety, has received world-wide recognition.

The All-Russian Research Institute for Nuclear Power Plant Operation (VNIIAES), of Moscow, is the scientific centre for Russian nuclear operating organizations. Principal attention is paid to assuring safe operation of the 1st and 2nd generation nuclear power plants.

Major reactor and NSSS design and research

- Experimental Design Bureau "Gidropress" (OKB GP), Podolsk
- Experimental Design Bureau of Machine Building (OKBM), Nizhny Novgorod

2.8.2. Development of advanced nuclear technologies

The leading 3rd generation medium- and large-scale power units of improved safety now include advanced WWER 1000 (for domestic market and export), WWER 1500 (replacement of the 1st

generation units and capacity growths), BN-800 (for plutonium utilization and solving of environmental problem) and BREST (nuclear technology of the 4th generation).

2.8.3. International co-operation and initiatives

Rosatom of Russia co-operates with other countries in many fields of activities, for example:

- nuclear physics
- fundamental research into matter properties
- controlled thermonuclear fusion
- physics of semiconductors and high-temperature superconductivity
- isotopes
- technologies of elementary particle accelerators and electrophysical equipment
- atomic energy generation and nuclear fuel cycle
- radioactive waste management
- environment protection

Rosatom's scientists and researchers are engaged in a wide range of studies, conducted by the various international centers for nuclear research, that is, the European Organization of Nuclear Research (CERN), the National Accelerator Laboratory and the Joint Institute for Nuclear Research. Russia participates in the International Thermonuclear Experimental Reactor quadripartite project. Rosatom scientists and engineers participate actively in both national and the international symposia, seminars and conferences. Rosatom of Russia is engaged in the intensive sharing and exchange of information at a bilateral level and through the International Nuclear Information System (INIS). Within the Rosatom structure there is a special Institute (Atominform), merging all information flows of the industry and dealing with the problems associated with protection of Rosatom's rights to the objects of intellectual property resulting from activities financed by the Ministry, as well as legal aspects of the transfer of these rights to third parties.

Recently, the problems of spent nuclear fuel reprocessing, of NPP safety and of environment protection have been gaining in importance. Russia co-operates with the US Department of Energy to establish the International Center of Ecological Safety in Russia (Rosatom of Russia) and in the USA (the Idaho National Engineering and Environmental Laboratory). Co-operation started in 1993, in management of spent nuclear fuel and of radioactive waste and in co-operation in rehabilitation of contaminated territories at the northwest of the Russian Federation with Norway, the European Commission, France, Sweden and USA, and these initiatives are still in progress. In 1998, through the Minatom initiative, Russia began to co-operate with France and Germany to construct reactor EPR in Russia. The joint working–group was formed, including experts from Minatom, Framatome and Siemens Company. The European Commission, rendering technical assistance on a gratuitous basis within the frameworks of TACIS Program, is one of the leading western partners. In 1998, the implementation of the Partnership and Cooperation Agreement (PCA) between Russia and the European Union was started. Throughout recent years, Russia has taken part in activities in compliance with the Agreement on ISTC.

Extensive activities to tackle problems of non-proliferation and safe dismantling of the Russian nuclear weapons and of weapons-grade plutonium and uranium conversion are in progress. For example, throughout 1994-1997, research and development activities to fabricate uranium-plutonium fuel for CANDU reactors from weapons-grade plutonium were carried out in co-operation with Canada. In 1999, Russia continued co-operation with Germany, Great Britain, Japan, Italy and France, with US participation, to ensure safe dismantling of nuclear weapons within the frameworks of the intergovernmental agreements on rendering assistance to Russia. At present, the joint Russian-US efforts are focussed on decommissioning of weapons-grade plutonium production reactors. In

1999, a draft Intergovernmental Agreement between the Russian Federation and the Netherlands on co-operation in safe dismantling of nuclear weapons in the Russian Federation and in utilization of removed nuclear-powered submarines was elaborated

By convention, the designing, mounting and commissioning of NPPs and large-scale production installations at the territories of the CIS and of the other countries form essential part of the international co-operation of Rosatom of Russia. Ukraine and Kazakhstan are the most active partners of Russia. A draft Agreement on co-operation in nuclear fuel cycle has been elaborated and coordinated recently with Ukraine. Activities to complete construction and to put into operation the Rovno and the Khmelnitsky NPPs are in progress. Russia supplies nuclear fuel to Ukraine, and transports spent nuclear fuel out of the country. Russia co-operates with Kazakhstan in production of nuclear fuel and in other aspects of the nuclear fuel cycle. An NPP is planned to be constructed on the territory of Kazakhstan.

Rosatom co-operates with China, Bulgaria, Slovakia, Korea, Indonesia, Cuba, India, Syria and Egypt in construction and operation of NPPs and large-scale production installations. We can note certain progress in the Russian-Japanese relations.

Russia takes part in the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO). The objective of INPRO is to support the safe, sustainable, economic and proliferation-resistant use of nuclear technology to meet the global energy needs of the 21st century. INPRO provides an open international forum for studying the nuclear power option and associated requirements, and its potential application in IAEA Member States. INPRO helps to make adequate competence available for the development and deployment of Innovative Nuclear Energy Systems (INSs), and helps to assist Member States in the coordination of related collaborative projects.

2.9. Human resources development

The industry personnel policy serves to keep and add to the personnel potential. There are 6 centers and Institutes for Advanced Professional Training of managerial and engineering staff, where up to 10,000 persons per year may be trained. The young personnel are trained in 20 high educational institutions, including 7 industrial ones, and in 21 technical colleges, professional and technical schools. The total number of persons trained in the industry educational institutions constitutes over 18,500, including over 6,000 students of high educational institutions

Training of the industry's scientific personnel, in 30 post-graduate schools established on the basis of the industry enterprises and in Institutes where up to 500 engineers are trained annually, occupies a highly important place.

Changeover from focusing on the solution of individual problems to the combined implementation of the complex program of job-security, social and economical development, social insurance, etc. is in progress, in co-operation with the local self-administration bodies and involving interaction with close administrative and territorial entities.

The training and procedure papers, simulators and training equipment have been developed within the frameworks of international scientific and engineering co-operation with the USA, Japan, Germany, France, Great Britain and Syria. Over 350 Russian engineers were trained abroad, and the training of foreign students in the industry base institutes was arranged.

2.10. Stakeholder Communication

Rosenergoatom fulfills the policy of transparency, as a key element in all stakeholder communication.

3. NATIONAL LAWS AND REGULATIONS

3.1. Regulatory framework

3.1.1. Regulatory authority(s)

The Russian Federal Supervision of Nuclear and Radiological Safety (Gosatomnadzor) is the Nuclear Regulatory Body of the Russian Federation, with the headquarters in Moscow and seven regional offices throughout the country.

The following regulations determine the procedure for nuclear power plant licensing:

- Regulations on the order of special permission, issued by Gosatomnadzor of Russia for examination of design and other materials and documents, substantiating safety of nuclear and radiologically dangerous installations and works: RD-03-12-94.
- Regulations on arranging and carrying out examination of design and other materials and documents, substantiating safety of nuclear and radiologically dangerous installations and works: RD-03-13-94.
- Regulations on the order of issuing of special temporary permissions for designing nuclear and radiologically dangerous installations and works: RD-03-14-94.

3.1.2. Licensing Process

The stages of obtaining the temporary permission (license) for NPP unit operation can be represented in brief:

i) License demand (submission of application documents)
ii) Gosatomnadzor decision on the demand control
iii) Analysis of substantiating materials of demand
iv) Inspection at the NPP
v) Conclusion on substantiating materials examination
vi) Conclusion on NPP inspection
vii) General conclusion on obtaining temporary permission (license)
viii) License (temporary permission)

3.2. Main National Laws and Regulations in Nuclear Power

The main laws controlling nuclear power in Russia are the law "About utilization of atomic energy" and the law "About state policy in the field of radioactive waste management".

Technical regulations created by Gosatomnadzor of Russia, which are in force today, are the legal framework for nuclear energy utilization. These regulations and rules address the aspects of safety assurance during site selection, designing, construction, operation, and decommissioning of nuclear installations. All regulating documents developed by Gosatomnadzor have been compiled into “List of main scientific and technical documents, used by Gosatomnadzor for safety regulation and supervision during production and utilization of atomic energy, handling of nuclear materials, radioactive substances and articles on their base”, P-01-01-03, Gosatomnadzor of Russia, 2003 (http://www.gan.ru/prav_b/acts.htm).

Some aspects of nuclear related activity are regulated by decrees of the President or Government of the Russian Federation.

Decrees of the President:

- "About the control of export of nuclear materials, equipment and technologies" of 27 March 1992
- "About the utilities with nuclear power plants " of 7 September 1992
- "About privatization of enterprises under the authority of Ministry for Atomic Energy, and their management in a market economy" of 15 April 1993, etc.

Decrees of the Government:

- "About approval of documents, regulating export of equipment and materials and of corresponding technology, used for nuclear purposes" of 29 May 1992
- “About measures of protection of the population living adjacent to nuclear power installations" of 15 October 1992

- “On Reorganization of the Nuclear Power Industry of the Russian Federation” of 17 April 2007, etc.

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Appendix 1: International, Multilateral and Bilateral Agreements

AGREEMENTS WITH THE IAEA

- Amendments to Articles VI & XIV of the Agency statute, Not ratified
- Agreement on privileges and immunities, Entry into force: 1 July 1966
- Unilateral safeguards submission (Voluntary offer) INFCIRC/327, Entry into force: 10 June 1985
- Additional Protocol, Signed: 22 March 2000
- Supplementary agreement on provision of technical assistance by the IAEA, Not yet concluded

MAIN INTERNATIONAL TREATIES

- NPT, Entry into force: 5 March 1970
- Convention on physical protection of nuclear material, Entry into force: 8 February 1987
- Convention on early notification of a nuclear accident, Entry into force: 24 January 1987
- Convention on assistance in the case of a nuclear accident or radiological emergency, Entry into force: 26 February 1987
- Vienna convention on civil liability for nuclear damage, Signature: 8 May 1996
- Paris convention on civil liability for nuclear damage, Not applicable
- Joint protocol relating to the application of Vienna and Paris conventions, Non-Party

- Protocol to amend the Vienna convention on civil liability for nuclear damage, Non-Party
- Convention on supplementary compensation for nuclear damage, Non-Party
- Convention on nuclear safety Entry into force: 24 October 1996
- Joint convention on the safety of spent fuel management and on the safety of radioactive waste management, Signature: 27 January 1999

OTHER RELEVANT INTERNATIONAL TREATIES/UNDERTAKINGS

- Improved procedures for designation of safeguards inspectors, Waiver proposal accepted by U.S.S.R. on: 15 September 1988
- ZANGGER Committee Member
- Nuclear Suppliers Group Member
- Acceptance of NUSS Codes Summary: A good basis for national safety standards. Taken into account in preparation of regulatory/technical documents. Best form of application in USSR being studied: 30 December 1988
- Nuclear Export Guidelines Adopted
- World Association of Nuclear Operators
- (WANO) Member

BILATERAL AGREEMENTS

Bilateral agreements on the peaceful use of atomic energy have been signed with USA, UK, Germany, France, Italy, Canada, Republic of Korea, Switzerland and other countries.

1. “Bilateral Agreement between Governments of the Russian Federation and the United States of America on Scientific and Technical Co-operation in the Field of Management of Plutonium Withdrawn from Nuclear Military Programmes”. Moscow, July 24, 1998.
2. “Threelateral Agreement between Governments of Russian Federation and Federal Republic of Germany and Republic of France on Co-operation in the Field of Peaceful Utilization of Plutonium Being Released as a Results of Dismantling of Russian Nuclear Weapons”. Moscow, November 28, 2001.
3. Russia-US: “Agreement on Co-operation in Research on Radiation Effects for the Purpose of minimize the consequences of the Radioactive Contamination on Health and environment”. Moscow, January 14, 1994.
4. Russia-US: “Agreement on Increasing of Operational Safety, Measures to Decrease Risk and on Nuclear Safety Standards of Civil Nuclear Facilities in Russian Federation”. Moscow, December 16, 1993.

Appendix 2: main organizations, institutions and companies involved in nuclear power related activities

NATIONAL ATOMIC ENERGY AUTHORITIES

JSC Atomenergoprom 119017, Moscow, Bolshaya Ordynka Str., 24/26	Tel.: +7 (495) 969-2939 Fax: +7 (495) 969-2936 E-mail: info@atomenergoprom.ru http://atomenergoprom.ru/en/nuclear/rus/
Federal Nuclear and Radiation Safety Authority Taganskaya ulitsa 34 109147 Moscow	Tel: (7 095) 272 0349 Fax: (7 095) 278 0098 Tlx: 411743 SYVIN SU
State Supervisory Committee for Nuclear Safety and Radiation Protection	Fax: (7095) 278 8090

OTHER NUCLEAR ORGANIZATIONS

Consortium of Russian Nuclear Power Plants “ROSATOMENERGO" B. Ordynka 24/26 K-74 Moscow 103074	Tel: (7 095) 239 24 22 Fax: (7 095) 239 27 24 http://www.rosatom.ru/
Obninsk Institute for Physics and Power Engineering Bondarenko Sq. 1 249020 Obninsk, Kaluga region	Tel: (708439) 9 82 50 Fax: (7095) 230 23 26 http://www.ippe.obninsk.ru/
All-Russia Scientific Research and Design Institute of Power Technology (VNIPIET) Dibunovskaya Str. St. Petersburg	Tel: (812) 239 01 34 Fax: (812) 239 18 98
Nuclear Safety Institute (IBRAE)	http://www.ibrae.ac.ru/
Institute “Atomenergoproekt” (AEP) Bakunin Str. 7 Moscow	Tel: (7095) 261 41 87
"Atommash" Krasnoarmeyskaya Str. 206 Volgodonsk Rostov reg.	
“Izhorskie zavody” Kolpino-1, Lenin Str. 1 St. Petersburg	Fax: (812) 463 92 69
“Rosenergoatom” Kitaisky pr. 7 Moscow	Tel: (7095) 220 63 01 Fax: (7095) 220 44 88
"Atomredmetzoloto" Bolshaya Ordynka Str. Moscow	Tel: (7095) 239 44 11 Fax: (7095) 239 46 79
TVEL Concern, Inc. Bolshaya Ordynka Str. Moscow	Tel: (7095) 239 43 55 Fax: (7095) 233 10 59
Russian Scientific Centre (RSC) “Kurchatov Institute" Kurchatov Sq. 1 Moscow	Tel: (7095) 196 92 41 http://www.kiae.ru/
State Scientific Centre "All-Russian Inorganic Materials Research Institute" (SSC VNIINM) Rogov Str. 5a Moscow 123060	Tel: (7095) 190 82 97 Fax: (7095) 196 41 68

State Scientific Centre "Nuclear Reactor Research Institute" (SSC NIIAR) Box M-5881 Dimitrovgrad Ulyanovsk Region	Tel: (84235) 3 52 80 Fax: (84235) 3 56 48 http://www.niiar.simbirsk.su/eng/riarsb.htm
All-Russian Research Institute for Nuclear Power Plant Operation (VNIIAES) Ferganskaya Str. 25 Moscow	Tel: (7095) 377 00 75 Fax: (7095) 274 00 73
Research and Development Institute of Power Engineering (NIKIET) P.O.Box 788 Moscow	Fax: (7095) 975 20 19
Experimental Design Bureau of Machine Building (OKBM) Burnakovsky pr. 15 Nizhny Novgorod	Tel: (8312) 46 21 32 Fax: (8312) 41 87 72
Experimental Design Bureau "Gidropress" (OKB GP) Ordzhonikidze Str. 24 Podolsk Moscow region	Tel: (7095) 137-90-96
Leningrad Nuclear Power Plant	http://www.laes.sbor.ru/

NUCLEAR RESEARCH INSTITUTES

Budker Institute of Nuclear Physics (BINP)	http://www.inp.nsk.su/
Frank Laboratory of Neutron Physics (FLNP)	http://nfdfn.jinr.ru/
Institute of General and Nuclear Physics (Kurchatov Institute)	http://www.ignph.kiae.ru/
Ioffe Institute for Physics and Technology	http://www.ioffe.rssi.ru/
Khlopin Radium Institute	http://www.atom.nw.ru/RIE/
Moscow Power Engineering Institute	http://mpei.ac.ru/
St. Petersburg Nuclear Physics Institute	http://www.pnpi.spb.ru/

HIGH ENERGY INSTITUTES

Bogoliubov Laboratory of Theoretical Physics (BLTP)	http://thsun1.jinr.ru/
Flerov Laboratory of Nuclear Reactions	http://sungraph.jinr.dubna.su/flnr/

(FLNR)

Institute for Nuclear Research (INR)	http://www.inr.ac.ru/
International Center for Fundamental Physics	http://www.icfpm.lpi.ru/
Joint Institute for Nuclear Research in Dubna (JINR)	http://cv.jinr.ru/
Laboratory of High Energies (LHE JINR)	http://lhe.jinr.ru/
Laboratory of Nuclear Problems (LNP)	http://nuweb.jinr.ru/
Laboratory of Particle Physics (LPP)	http://sunse.jinr.ru/
Skobeltsyn Institute of Nuclear Physics (SINP, Moscow)	www.npi.msu.su:80/inp50/english/index.html
Saint-Petersburg State University (Radiophysics scientific school)	http://www.phys.spbu.ru/Departments/RadioPhysics/
International Science and Technology Center (ISTC)	http://www.istc.ru/

OTHER ORGANIZATIONS

Republican Research Scientific-Consulting Center for Expertise (RRSCCE)	http://www.extech.msk.su/
Emergency Response Centre (FEERC)	http://www.typhoon.mecom.ru/

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