IZHORSKIYE ZAVODY

Izhorskiye Zavody is the largest company of the Russian heavy engineering industry. The enterprise is involved in designing, manufacturing and servicing of equipment for traditional and nuclear power plants, oil and natural gas complexes and mining industry.

Principal fields of expertness

- designing of separate components of NPP power-generating units with vessel-type pressurized water power reactors (VVER)
- production of vessel equipment of the primary circuit of vessel-type pressurized water reactors (VVER) for NPP;
- designing and manufacturing equipment for handling spent nuclear fuel of various types of reactors;
- supply of spares.

One of strategic lines of activities of Izhorskiye Zavody is designing and manufacturing of equipment for atomic power engineering.

Facilities of Izhorskiye Zavody are powerful enough for production and supply of the "nuclear island" (a complex of systems and mechanisms of a reactor hall placed under a containment shell) for power plants with vessel-type pressurized water reactors.

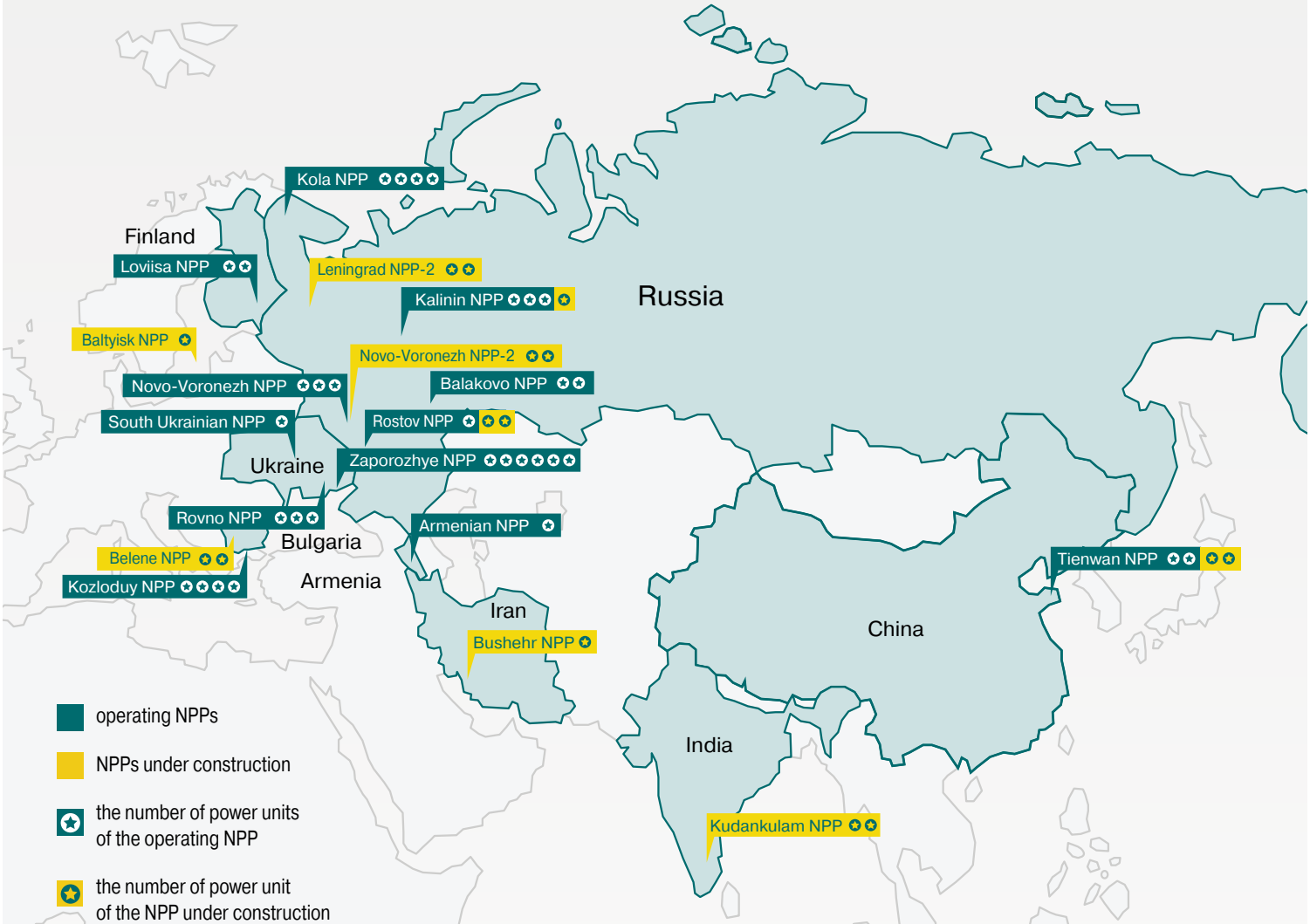
Designing, manufacture, testing and inspection of the equipment are executed in full compliance with normative documents of the Russian Federation and IAEA requirements and under supervision of the Federal Service for Ecological, Engineering and Atomic Inspection (Rostekhnadzor).

The faultless operation of vessel-type pressurized water power reactors manufactured by Izhorskiye Zavody in NPPs of many countries over the period of half-century are proof of their reliability and safety.

When building modern reactor units, the principle of defense in depth shall be observed, to prevent any release of fission products into the environment in case of any nuclear accident, however severe, including that accompanied with destruction of the core. The NPP equipment may be both of tropicalized and seismic-proof design.

At all stages of the life cycle of the equipment, there shall be provided the adequate author's supervision of erection of the reactor units and the engineering support of their operation and maintenance.

GEOGRAPHY OF DELIVERIES OF THE NPP EQUIPMENT



Recent foreign projects

In the last decade, Izhorskiye Zavody had manufactured equipment for fife reactor units of foreign nuclear power plants: 1 unit of Bushehr NPP (Iran), 2 units of Tienwan China), 2 units of Kudankulam (India).

Bushehr NPP (Iran)

The reactor vessel was shipped in October of 2001.

Tienwan NPP (China)

The reactor vessels for the 1st and the 2nd units were shipped in 2001 and 2002.

For the first time in the world-wide practice, Izhorskiye Zavody had manufactured the active core melt localization unit, thus ensuring the radically new NPP safety level.

Kudankulam NPP (India)

The reactor vessels for the 1st and the 2nd units were shipped in 2004 and 2005.

In the delivered equipment there are provided several consecutive protection stages and additional passive security systems connected with conventional active cores resulting in the enhanced security of the NPP.

Belene NPP (Bulgaria)

Izhorskiye Zavody shall deliver to this NPP under construction the reactor equipment for two power units: vessels of VVER-1000 reactors and vessel internals. The first reactor vessel is planned to be manufactured in December of 2011, the second one – in November of 2012.

Recent Russian projects

Izhorskiye Zavody is taking part in the implementation of the long-term State Program of development of the domestic nuclear power industry.

Rostov NPP

In 2008 Izhorskiye Zavody delivered the vessel of the VVER-1000 reactor, its internals, the upper unit, inspection cavity equipment, equipment for installation, mounting, maintenance and repair.

Novo-Voronezh NPP-2

The power plant was designed and being erected according to the NPP-2006 project that is implementing an advanced and improved technology of the vessel-type pressurized water power reactors (VVER); improvements were made in safety enhancing and ensuring of better technical and economic characteristics.

In 2007 were signed up contracts for manufacture and delivery of two sets of the major power equipment of the VVER-1000 power plant. The first power block of the Novo-Voronezh NPP-2 is planned to be put into operation in 2012, the second unit – in 2013.

Leningrad NPP-2

In 2008 was signed-up the contract for manufacture and delivery of the vessel equipment for the Leningrad NPP-2 under construction. Izhorskiye Zavody shall deliver the vessel equipment for two power units: reactor vessels complete with their internals, upper units, pressurizers and other equipment.

REFERENCE LIST
EQUIPMENT FOR NPP

No.	NPP	Unit No.	Reactor type	Start-up year
1	Novo-Voronezh NPP	1	VVER-210	1964(84)
		2	VVER-365	1970(90)
		3	VVER-440	1971
		4	VVER-440	1972
		5	VVER-1000	1980
2	Kola NPP	1	VVER-440	1973
		2	VVER-440	1974
		3	VVER-440	1981
		4	VVER-440	1984
3	Armenian NPP (Armenia)	2	VVER-440	1979(95)
4	Kalinin NPP	1	VVER -1000	1984
		2	VVER -1000	1986
5	South Ukrainian NPP	1	VVER -1000	1982
6	Zaporozhje NPP (Ukraine)	1	VVER -1000	1984
		2	VVER -1000	1985
		3	VVER -1000	1986
		4	VVER -1000	1987
		5	VVER -1000	1989
		6	VVER -1000	1995
7	Rovno NPP	1	VVER -440	1980
		2	VVER - 440	1981
		3	VVER - 1000	1986
8	Balakovo NPP	2	VVER - 1000	1987
		3	VVER -1000	1988
9	Bogunitse NPP (Slovakia)	1	VVER - 440	1978
		2	VVER - 440	1980
10	Kozloduy NPP (Bulgaria)	3	VVER - 440	1980
		4	VVER - 440	1982
		5	VVER -1000	1987
		6	VVER -1000	1991
11	Loviisa NPP (Finland)	1	VVER - 440	1977
		2	VVER - 440	1980
12	Bushehr NPP (Iran)	1	VVER -1000	under construction
13	Tienwan NPP (China)	1	VVER -1000	2007
		2	VVER -1000	2007
14	Kudankulam NPP (India)	1	VVER -1000	under construction
		2	VVER -1000	

EQUIPMENT FOR NPP

New nuclear power plant unit projects implemented during last years were actually based on satisfactory solution of engineering problems made possible due to the company expertise assumed in the course of manufacture and operation of the unified reactor VVER-1000 and advanced technologies.

ENGINEERING ACHIEVEMENTS




The enterprise Izhorskiye Zavody is recognized as a leader of the Russian power engineering. The enterprise is a sole Russian manufacturer of the primary circuit equipment for NPPs with vessel-type pressurized water power reactors.

1957 – the year manufacturing of the equipment for NPPs was started up.

1958 – manufacturing of transport power plants for nuclear submarines was started up. The whole number of reactor plants produced for nuclear submarines of the 1st, 2nd, 3rd and 4th generations was more than 100.

1961 – the year when the first Russian vessel-type pressurized water power reactor of the power 210 MW was manufactured.

1971 – there was manufactured the first set of the batch-produced plant with the reactor VVER-440 (in all, there were produced 24 sets).

1977–1980 – the period when updated reactor plants VVER-440 were delivered to Finland, for the 1st and 2nd power units of the Loviisa NPP. Since then, for more than 20 years this NPP is in smooth steady trouble-free operation. By its performance and technical & economic indices this NPP is one of the best world plants.

1979 – the first set of the batch-produced reactor plant VVER-1000 was manufactured.

2001 – an experimental containment shell for VVER-1500 was manufactured from an 360 t ingot.

2001 – an updated 1000 MW reactor plant was manufactured for the Bushehr NPP (Iran).

2001 – the first power unit of the enhanced-safety 1000 MW reactor plant was manufactured for the Tienwan NPP (China).

2002 – for the first time in the practice of world power machine building, Izhorskiye Zavody provided the first unit of the Tianwan NPP with a melt localization facility (MLF) for the active core, to protect the reactor building bedplate against destruction by melt. The bed-type MLF structure developed by specialists of Izhorskiye Zavody, in addition to eliminating effectively the danger of penetration of melt through the reactor building bedplate, allows also to solve the problem of the corium localization, if any uncertainty arose in case of a severe nuclear accident. Development of the melt localization facility is actually a new engineering project in the nuclear power engineering. The principal novelty of this project is a unit-cast structure of the vessel bottom used for the first time in the world practice. This engineering solution was put to tests and examination by international group of experts and is now wholly accepted by the world engineering community.

2003 – the end of delivery of complete equipment for the 1st and 2nd power units of the Tianwan NPP (China).

2004-2005 – manufacturing of equipment for the 1st and 2nd power units of the Kundakulam NPP (India).

2008 – manufacture of an unique "transportation lock" for the Kudankulam NPP (India) is completed. This lock is actually a hermetically sealed and locked chamber, to protect the NPP personnel and the environment from radiation during reloading of nuclear fuel.

2008 – the first reactor vessel for the floating NPP KLT-40S (КЛТ-40С). Floating NTPP MM are ideal power and heat sources indispensable in development of remote areas of the Far North. The reactor plant KLT-40S is acknowledged as the most effective and best engineered of floating NPP. Moreover, it is based on an operating prototype, for reactors of this type are installed on nuclear-powered icebreakers. They were in use for more than 35 years.

2010 – the first Russian power reactor of the XXI century VVER-1200 was produced for the Russian nuclear power plant, the second stage of the Novo-Voronezh NPP. This NPP is being built from the design NPP-2006 that is an evolutionary elaboration of the well-proven technology of the NPP with vessel-type pressurized water power reactors. This time, the 1200 MW reactor is used.

EQUIPMENT FOR NPP

Engineering subdivisions of Izhorskiye Zavody have wide technical potentialities, production facilities and highly qualified specialists involved in designing and developing equipment for various types of NPP reactor plants, large freight containers for transportation of radioactive equipment, A-waste and technological & transportation equipment of NPPs.

ENGINEERING




The powerful engineering base and long-time successful cooperation with principal Russian and foreign scientific and design centers working in the field of nuclear power engineering is one of competitive advantages of Izhorskiye Zavody.

Since 1957 the United Design Bureau (OKB) of Izhorskiye Zavody is involved in development of power reactors. It is engaged in intensive design and development activity in the field of power-generating equipment. The United Design Bureau was given the Rostekhnadzor license for designing nuclear power plant equipment.

Specialists of high qualification are elaborating design concepts, executing analyses of strength, calculations of heat engineering and physical characteristics at all stages of design.

The crucial factor of designing the new generation of NPP equipment is ensuring of environmental security for all modes of the plant operation.

New projects of NPP-2006 with reactor plants VVER-1200 are developed on the base of concept that radiation action on the environment during the long-time normal operation of the NPP, as well as in case of assumed operating troubles shall not result in increase of the background radiation level predetermined by effective normative documents.

Higher level of safety is achieved basing on the attained experience in development and operation of power units with reactors VVER-440 and VVER-1000.

The specific feature of the new NPP generation is a self- protection principle implemented in them. Along with active safety systems, in these reactors are used passive systems based on natural physical processes that depend in no way from the personnel actions.

All the project developments and designs of the power-generating equipment executed by specialists of Izhorskiye Zavody are in compliance with IAEA requirements concerning reliability and safety.

Unique production facilities of Izhorskiye Zavody metallurgical and machine-building complexes and their own engineering capacities make it possible to arrive at complex solutions of implementation of new materials and advanced technological processes when manufacturing equipment for nuclear power-generating equipment.

Successes of the enterprise on the market of nuclear power-generating equipment are depending in great part by the high technical potential and adequate human resources indispensable for execution of research and development projects and development activity.

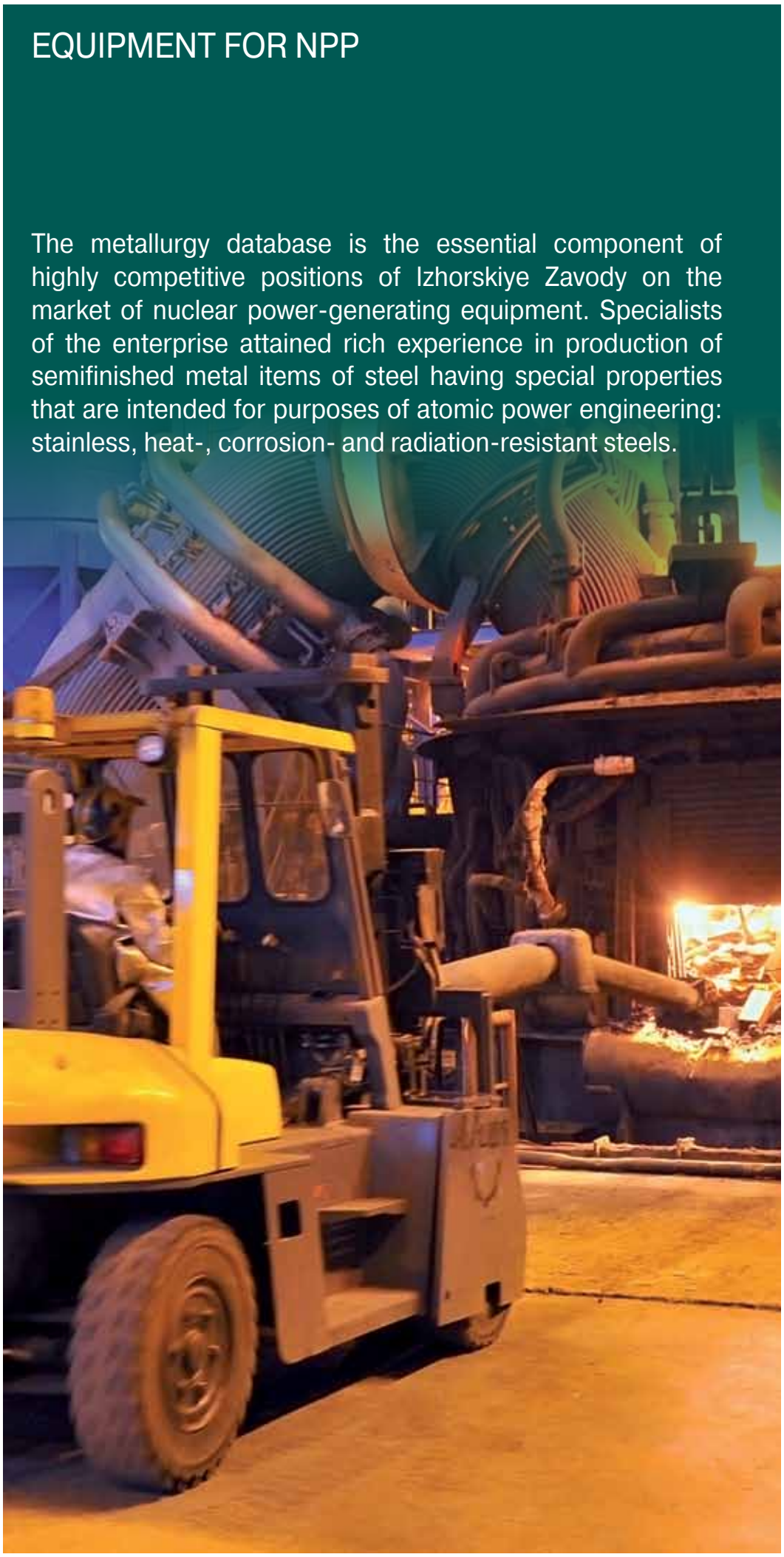
The company's Scientific Research Center (SRC) is carrying out the wide range of tests and researches in accordance with requirements of domestic and foreign standards. As a Russian leading laboratory in its branch of industry, the SRC is providing support for the entire process flow of product manufacturing, in the field of material science, from the order elaboration and design to handing over of finished products to a customer.

Our partners

- Atomenergoproekt – the general designer of the NPP-2006 project
- OKB Gidropress – the principal designer of the reactor plant of NPP-2006 project
- Rossiyskiy nauchny tsentr Kurchatovskiy Institute (Russian scientific center – Kurchatov Institute) – the institute executing scientific management of the project NPP-2006
- TsNII KM Prometey – the leading institute in the field of metal science
- TsNIITMASH – the leading institute in the field of metal science
- Konstruktorskoe byuro spetsialnogo mashinostroeniya (Design bureau of special machine building) (KBSM) – the general designer of transportation & packing containers for various types pf reactors
- Golovnoy institute VNIIPIET – head organization engaged with problems of development of novel nuclear technologies of spent nuclear fuel disposal

EQUIPMENT FOR NPP

The metallurgy database is the essential component of highly competitive positions of Izhorskiye Zavody on the market of nuclear power-generating equipment. Specialists of the enterprise attained rich experience in production of semifinished metal items of steel having special properties that are intended for purposes of atomic power engineering: stainless, heat-, corrosion- and radiation-resistant steels.



PRODUCTION AND TECHNOLOGIES




Izhorskiye Zavody is a sole large enterprise in Russia that retained yet both making of high-quality steels and well developed machine building. Production facilities of the enterprise make it possible to manufacture products of unique dimensions and excellent characteristics that is in high demand in Russian and foreign markets if nuclear technologies.

Izhorskiye Zavody is manufacturing vessel equipment for the primary circuit of nuclear power plants with the vessel-type pressurized water power reactors (VVER):

- reactor vessel with internals and the upper unit;
- the equipment of the reactor cavity encased in concrete;
- steam generator vessel;
- collector;
- pressurizer;
- ECCS (emergency core cooling systems) and PCRS (passive core reflooding system) accumulators
- the main circulation pump body;
- main circulation pipelines;
- transportation & production equipment
- drives of the control and protection system and others;
- spares.

The enterprise had developed its own process of production of two-layer (clad) metal sheets for items intended for purposes of atomic power engineering. High-capacity equipment, advanced technologies, know-how and modern control system ensure high-quality of workpieces.

The use of the automated complex for forging by applying 120 MN (12000 tf) and advanced technologies allow to manufacture forgings up to 5.5 m in diameter, of the mass up to 235 t, thus minimizing the number of welds in vessels of the nuclear reactor equipment.

The technique of punching branch pipe ports in the core containment shell of the reactor core had been mastered, thus eliminating completely the necessity of welding in the core region.

Specialized shops of Izhorskiye Zavody intended for power plant production are rigged with up-to-date machining, welding, thermal treatment equipment designed to work with large-sized items of the mass up to 400 t.

The large stock of metal-cutting machine tools and multifunction high-speed machining centers make it possible to carry out single-setup machining of formed components and ensure high accuracy of machining.

Advanced welding technologies are elaborated to weld items of considerable thickness. Special welding bedsteads designed for automated welding and subsequent heat treatment ensure the high quality of products.

- For steelmaking, the electric arc furnace ДСП(DSP)-120 of the capacity 120 t is used.
- For forging and stamping of large-sized items, there is used the automated forging complex АКК -12000 applying force of 12000 tf with the forge manipulator of the capacity 250 t and forge cranes of the capacity 450 and 700 t.
- Machining equipment of Izhorskiye Zavody makes it possible to work with items of the diameter up to 12 m, height up to 7 m, of the mass up to 400 t.
- Advanced technologies of welding and building-up welding enable many specific operations: welding of narrow-grooving items of the thickness up to 350 mm; ESW deposition welding; welding-on of uniform single-layer corrosion-resistant coating 5 to 2 mm thick on the inner surface of shells and bottoms.

EQUIPMENT FOR NPP

Izhorskiye Zavody has all potentialities to elaborate optimal installation technologies still in the phases of manufacture and preliminary (test) assembling of equipment; these technologies shall provide high efficiency and profitability of installation works, improve their quality, reduce expenses and the construction time.

SERVICE




Installation and commissioning works at nuclear power plant sites, along with development of other services are perspective lines of activities of Izhorskiye Zavody. Following trends of the present world market of nuclear power plant equipment and technologies, Izhorskiye Zavody is eager to develop its potentialities in rendering various services.

The unique half-century long experience of Izhorskiye Zavody in designing and manufacturing of nuclear power plant equipment, including also transportation & technological equipment, is a prerequisite for elaboration of adequate qualified engineering solutions for the entire process flow of manufacturing the primary circuit of the nuclear power plant. This factor shall ensure for the enterprise certain competitive advantages in rendering high-quality services in installation, start-up and adjustment operations, repair, updating and maintenance of nuclear power-generating plant projects in the course of their exploitation.

The operation safety of nuclear power plants shall be maintained not only by means of meeting all requirements to elaboration of design concepts and solutions and to the equipment manufacture, but also by fulfillment of requirements concerning installation, maintenance and repair of the equipment. The reliability of power plant equipment and the NPP safety during the operating period are depending, to a large extent, on the quality of installation, maintenance and repair works.

The enterprise Izhorskiye Zavody has all potentialities to elaborate optimal installation technologies still in the phases of manufacture and preliminary (test) assembling of equipment; these technologies shall provide high efficiency and profitability of installation works, improve their quality, reduce expenses and the construction time.

High qualification of installers, adjusters, welding operators, engineers and technical personnel, their experience attained during their work at domestic and foreign power plants and industrial enterprises, availability of various installation equipment and tools, mastering of up-to-date installation and welding technologies confirmed by licenses issued by the Federal Service for Ecological, Engineering and Atomic Inspection (Rostekhnadzor) – all these factors make it possible for Izhorskiye Zavody to carry out the whole complex of installation works, including start-up and adjustment operations, setting up thermal insulation and corrosion protection of equipment, pipelines and structures at sites of domestic and foreign power plants.

Izhorskiye Zavody had confirmed the enterprise's high technical potential when taking part in construction of a number of nuclear power plants in Russia and abroad. For instance, the company

executed installation works at the site of Bushehr NPP (Iran), as well as installation of the sheath of the single domestic large-sized stand for simulation of emergency processes КМС НП 500 (KMS NP 500) in the North-Western Scientific and Industrial Center of Atomic Power Engineering (Sosnovy Bor) and installation of the melt localization unit at the Tianwan NPP (China) and others.

As the manufacturer, the company Izhorskiye Zavody is providing adequate author's supervision of construction of all domestic and foreign nuclear power units, as well as engineering support of their operation during their whole life cycle.

QUALITY ASSURANCE STRATEGY




The Izhorskiye Zavody trademark is well-known on markets of high-technology engineering products. These traditions of high quality and reliability had been established by efforts of many generations of the company's workers for almost three centuries.

The main goal of the quality policy is to ensure the conformity of the level of engineering, manufacture and technologies with highest international standards and requirements.

Izhorskiye Zavody was the first Russian enterprise granted the Bureau Veritas certificate (BVQI) in 1992, to certify the conformity of its quality assurance system with international standard ISO 9001.

At present, the enterprise has the effective Quality Management System (QMS) meeting requirements of international standard ISO 9001:2008 certified by Bureau Veritas and the Russian committee Gosstandart Rossii.

Production of NPP equipment is certified by the license issued by the Federal Service for Ecological, Engineering and Atomic Inspection (Rostekhnadzor).

To the enterprise Izhorskiye Zavody are issued certificates as follows:

- No. RU 227553 of November 27, 2009 certifying conformity with international standard ISO 9001:2008 issued by Bureau Veritas Certification, valid till November 26, 2012.;
- No. ROSS RU.ИСО9(IS09). K00901 of January 14, 2010 certifying conformity with national standard GOST R ISO 9001-2008 issued by the quality system certification authority OOO TEST St.-Petersburg, valid till January 14, 2013;
- No. RU-Q00901of January 14, 2010 certifying conformity with international standard ISO 9001:2008 issued by IQNet, valid till January 14, 2013;
- Nos. 36.093 and 32.094 of October 09, 2009 certifying the right to manufacture pressure vessels having stamps U and U2, in accordance with ASME Code, valid till January 11, 2012.

The conformity of QMS of the enterprise with requirements of standard ISO 9001 shall be checked annually by major BVC auditors and auditors of OOO TEST St.-Petersburg

The Quality Management System shall offer a guarantee to customers that the proper quality is provided at all stages of production, from designing to installation, as well as technical support of servicing.

To attain and maintain necessary qualification and experience in professional activities and up-to-date techniques of management, the recurrent personnel training and attestation shall be stipulated.

Permanent improvement of the product quality shall be achieved by means of development of production processes, implementation of novel technologies and manufacturing facilities & accessories, tools, instruments and control equipment.