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ACTIVITY ANALYSIS AND PERSPECTIVES OF DEVELOPMENT OF POWER EQUIPMENT PRODUCTION IN RUSSIA

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АНАЛИЗ СОСТОЯНИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ РОССИЙСКОГО ЭНЕРГЕТИЧЕСКОГО МАШИНОСТРОЕНИЯ

In clause problems of competitive situation in domestic energy machine industry at the present stage are studied. Main tendencies of its development are stated due to growth of sales opportunities and improvement of product quality.

ACTIVITY ANALYSIS. ECONOMICS OF INDUSTRY. THE ENERGY MACHINE INDUSTRY. INNOVATION LEVEL. INVESTMENT APPEAL.

Рассмотрены вопросы, связанные с состоянием энергомашиностроительной отрасли на современном этапе. Определены тенденции ее развития с учетом повышения конкурентоспособности и качества производимой продукции.

АНАЛИЗ ДЕЯТЕЛЬНОСТИ. ЭКОНОМИКА ОТРАСЛИ. ЭНЕРГЕТИЧЕСКОЕ МАШИНОСТРОЕНИЕ. ИННОВАЦИОННЫЙ УРОВЕНЬ. ИНВЕСТИЦИОННАЯ ПРИВЛЕКАТЕЛЬНОСТЬ.

Energy independence characterizes the level of economy development and its growth opportunities. That is why the energy machine industry is one of the main elements of providing the technical level of national security.

The energy machine industry plays the leading role in the development of the most important branches of domestic industry providing the equipment for nuclear power industry, fuel and energy complex, metallurgy, transport, public utilities, defense, and other branches of industry. The energy machine industry includes engineering, production, delivery, assembly, servicing and modernization of equipment for thermal stations, nuclear, hydraulic and gas-turbine power plants, and others.

The equipment produced at the power engineering factories is science intensive, expensive, unique and low volume production with prolonged cycle of manufacturing (up to 5–7 years). At the same time, capital-intensive character of power engineering and high threshold of entry into the industry specifies the high level of production concentration.

The share of Russia's participation in the world market is currently insignificant ($1.5–2.5 bln) and is about 2.0 % (see Tab. 1) [1].

Table 1

The Structure of the Global Market of Power Machine Engineering

Producer	The world market share, %	Volume of output of power equipment, $ bln	
		2010 year	2011 year
General Electric Energy	24.0	29.0	31.1
Siemens PG	16.0	17.3	20.0
Alstom Power	10.0	15.7	15.3
MHI PS & GM	10.0	14.5	16.1
Russian manufacturers	~2.0	~2.0	~2.4

Source: Accounting of companies, Ministry of industry & trade of Russia.

The Russian industrial sector numbers more than fifty enterprises, where the level of competition remains limited because of the historical specialization and uniqueness of the product. «Power Machines», Group of Companies «Atomenergomash», «OMZ» Group, and «ENERGOMASH» Business Group play the key role.

According to data of The Ministry of industry and trade of Russia the share of power engineering industry in the gross domestic product is 0.2 % (until the 1990s – 3.0 %). It refers to the branches which supply the equipment in order to achieve the overall purposes of the national security and dynamics of economic growth [1].

The whole situation in the Russian power equipment market is characterized by the gap between the amount of the applications for the equipment supply and the number of the contracts financed by the customers. In this respect, the export contracts are more reliable and predictable: unlike the Russian contracts they ensure loans to finance manufacturing. Nowadays, production export is 20–30 %, out of which the biggest share (40–60 %) is steam and hydraulic turbines. It is worth noting that export structure preserves the traditional proportions typical of the Soviet export: ~55 % of export (excluding nuclear power equipment) goes to Asia, up to 35 % – to South America, and a small share goes to Europe (the value of export of energy machines in 2011 amounted to more than $300 mln). The biggest import share in the domestic market (about 50 %) is for gas turbines (import value is about $100 mln).

According to Russia's statistics department, in 2011 the summarised financial earnings of the factories of power engineering complex exceeded 45 bln rubles. By the end of the year, 74 % of the factories were profitable. The average efficiency of the production sold in 2011 was 7–10 %, production index was 106.9 %, and the revenue was about 150 bln rubles [2]. One of the reasons of the energy machines production growth became the realization of capacity supply agreements by the Energy companies. It is stimulated by higher tariffs on the capacity, and other benefits, which allow quick return on investments. In addition the demand increased for gas processing units for pipeline transport. The growth of gas turbines production was faster than the growth rate of steam and hydraulic turbines production [3].

The structure of the domestic energy machine industry in terms of the companies' income in 2011 is shown in Fig. 2, and the structure of products manufactured by companies in Fig. 3.

The number of employees occupied in power machine production is close to 105 000 people. The average monthly salary in the biggest enterprises reaches 28 000 rubles, which is up to 93.3 % of the average level in the whole industry.

The tear and wear of test and bench facilities in the majority of factories reaches 90–100 %, industrial funds of the basic activity is 54–57 % including machines, and equipment is above 75 %.

Over 60 % of the main technological equipment in the power machine plants worked off from 20 to 30 years. That is why the productivity of the machinery equipment decreased, labour-intensive job increased, and self-cost and quality of the product conceded to foreign analogues.

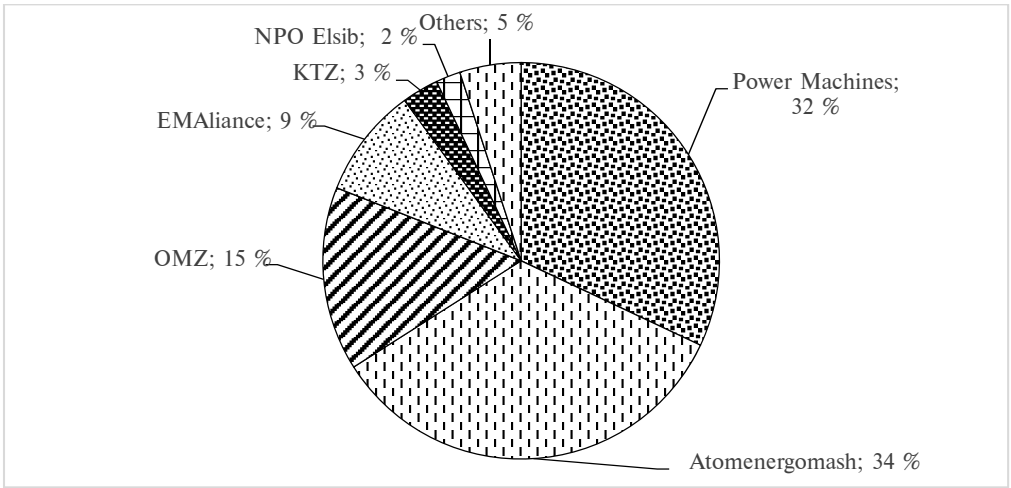

Fig. 2. The structure of energy engineering industry of Russia in 2011.

Source: «Atomenergomash»

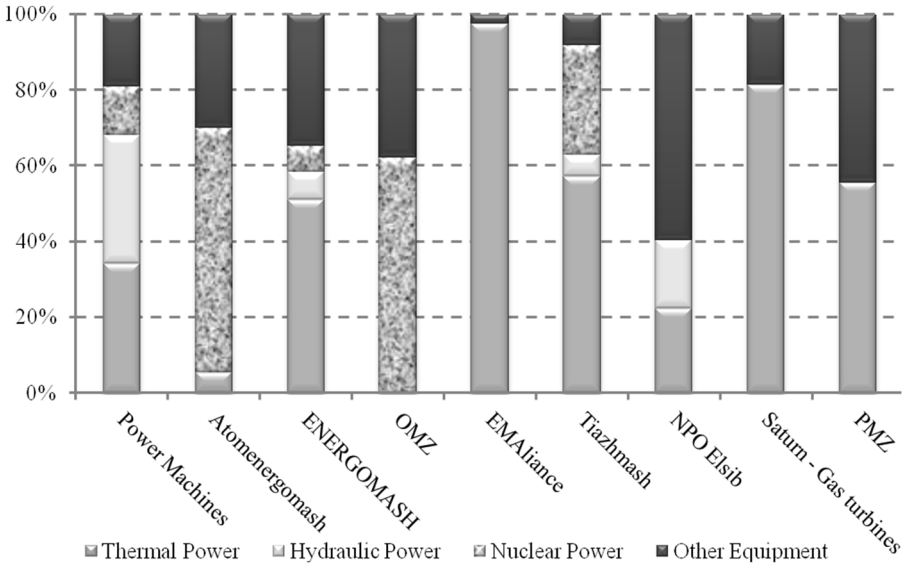

Fig. 3. The structure of products manufactured by energy engineering industry

Source: Accounting of companies.

The level of advanced technologies in this branch of industry is no more than 14 %. At the same time, high-performance equipment is concentrated mainly in the gas turbines production, which is relatively new in Russian power engineering industry. The analysis of the capacity planning shows that the most high machine utilization coefficient at the plants producing gas turbines ranges from 40 % to 70 %. For other types of products, the level of industrial equipment load averages 20–30 % [3, 4].

The current state of the industry leaders raises serious concerns regarding the possibility of self-reliant realization of the projects on sharp increase of power generating capacities in Russia. The main results of the financial-economic activities of the largest enterprises are given in Tab. 2.

The wear and tear of energy equipment in Russia demands technology and innovation breakthrough which requires significant investments and pooling the efforts of all Russian plants. The global competition demands the establishment of large companies in Russia. Otherwise insufficient financing may hold back modernization and renovation.

In order to solve the problems of financing investment projects and competition with the foreign producers, the domestic energy equipment producers underwent expansion of their businesses in the mid-1990s creating financial-industrial groups («Energomashcorporation», «Uralmash-Izhora» (OMZ), «Power Machines», «EMAlliance»). The company «Atomenergomash» was established within the system of «Rosatom» in 2006. The last merger of «EMAlliance» and «Power Machines» took place in February 2012.

As the output of the foreign companies in the Russian market is limited, global cooperation develops. «Power Machines» has the license of the company Siemens to manufacture gas turbines with the capacity of 160 MW and 270 MW (31 units were produced in the last 7 years). In 2011, «Power Machines» signed an agreement with Siemens to establish a joint venture «Siemens Technologies Gas Turbines» to manufacture and provide maintenance of gas turbines of over 60 MW, with the share of Siemens being 65 % and «Power machines» share being 35 %. In 2012, «Power Machines» and the Japanese Corporation Toshiba reached an agreement to construct a plant for manufacturing and supplying power transformers voltage class from 110 kv to 750 kv, with capacity from 25 MBA to 630 MBA worth more than 5 bln rubles in investments. The plant will be built on the sites of «Power Machines» in the town of Metallostroy near Saint-Petersburg, and phase one of the constructions of the new power equipment plant is in progress.

Table 2

Operational and Financial Results

Indicator	Year	Power Mashines	EMAlliance	Atomenergomash	Izhorskiye Zavody (OMZ)	NPO Elsib	Saturn – Gas Turbines	Tyazhmash	Klimov	ZVEZDA	PMZ
The Portfolio of Orders, $ mln	2009	1688	1356	1287	–	69	–	207	–	–	300
	2010	4194	1542	2587	–	63	–	324	–	–	345
	2011	5080	1708	2846	–	154	–	394	–	–	375
The Revenue, bln rubles	2009	51.8	9.6	16.0	6.8	1.7	3.16	4.9	3.3	0.9	11.5
	2010	45.3	13.8	20.0	5.7	2.2	6.2	4.1	5.5	1.37	13.6
	2011	47.3	12.4	50.9	7.2	2.1	7.3	5.4	6.9	0.85	14.3
The Cost, bln rubles	2009	36.6	6.9	12.3	4.7	1.1	2.65	3.08	2.56	0.77	10.8
	2010	30.8	9.98	15.2	4.5	1.44	5.54	2.49	4.72	0.95	11.2
	2011	31.4	9.0	41.5	6.0	1.37	6.67	3.8	6.59	0.87	12.4
The Net Profit, mln rubles	2009	6006	355	1382	231	69	104	990	292	20	-209
	2010	6542	520	725	195	96	183	503	465	224	10
	2011	9253	72	1707	10	21	95	197	–68	0.23	2
The Average Number of Personnel, person	2009	18061	4077	8593	2808	1655	2346	3586	2070	1243	8491
	2010	10573	4192	10027	3247	1879	2348	3468	2000	1177	8178
	2011	10489	4366	21254	3491	1917	2319	3924	2000	1300	8147
The Average Salary, rubles	2009	36500	16000	30200	30133	25688	18330	13760	26100	19242	19100
	2010	37500	16894	34600	33444	27597	23199	15607	31591	27795	21600
	2011	52000	19428	38000	36690	29620	23647	17091	35697	33248	25151
Investments, mln rubles	2009	1990	174	1615	2400	297	134	–	–	16	437
	2010	3927	418	12838		264	301	–	10	110	494
	2011	4300	1760	5245		231	362	2736	19	44	453
	2012[p]	4700	200	–		–	–	4000	–	–	–

Source: Consolidated Accounting of companies in 2009–2011.

According to the agreement, the Russian-Japanese joint venture will allow to solve the problems of complex modernization of the main electric grid facilities on the basis of the advanced innovative technologies.

Since 2007 a priority direction of «Atomenergomash» activity becomes the development of the international cooperation and the output in the global market. Joint venture «Alstom Atomenergomash» was created together with the French company Alstom Power Holdings SA to produce half-speed turbines and generators for nuclear power plants on the basis of the licensed technology «Arabell». «Zio-Podolsk» is the shareholder of 51 % of this company. Besides, a working group with Toyota was established in 2008. And in 2009 «Atomenergomash» in the face of a group of companies REMCO signed the

license agreement with the Dutch company NEM to promote the boiler equipment for thermal power engineering.

In 2007 the Japanese Corporation Mitsubishi Heavy Industries concluded an agreement on partnership with Ural turbine plant to produce by the Japanese license gas turbines with the capacity from 170 MW to 270 MW and also steam turbines of high power (up to 660 MW). Such a strategy would allow to increase its production level up to the world level within a short time.

General Electric cooperates actively with the Russian aircraft building plants in production of turbines of small capacity. General Electric (has a 50 % share in the capital), the holding company «InterRAO UES» and «United engine-building Corporation» in face of «Saturn – Gas Turbines» (each has 25 % of shares) signed an agreement to establish a joint venture to build a plant in Yaroslavl region of Russia for manufacturing and further implementation of the high-performance industrial gas turbines with low emission 6FA with the capacity 77 MW. The start-up of the plant value of 5 bln rubles is planned for 2013. The enterprise should produce 14 sets a year.

In 2008 General Electric and REP Holding in the framework of the license agreement on the localization technologies signed the contract for assembly of gas-pumping units GPA-32 «Ladoga» on the basis of gas-turbine plants GE MS5002E at «Nevskiy zavod». The technology GE MS5002E is an improved version of the production line GE MS5002. The new turbine is distinguished by its high industrial type of efficiency 36 %, the low level of emissions, and significant resource of work, high reliability, and operating longevity in comparison with the Russian units. The gas turbines GE fifth series are in operation around the world more than 16 mln of hours.

The companies Alstom and «RusHydro» have established a joint venture «AlstomRusHydroEnergy» in 2011. «RusHydro» has 50 % plus one share in the capital of the joint venture. The joint venture will manufacture the equipment for small hydropower plants with the capacity 25 MW, and with the average capacity 100 MW, for pumped storage power plants with the capacity of up to 150 MW, and also the support equipment in Ufa (Bashkortostan) up till 2013. Alstom ensures the implementation of best practices of operational management and the transfer to the joint venture of advanced technologies for the equipment production and its further maintenance in accordance with the license agreement. The total project investment will amount to 125 mln Euro.

The opportunities of development of the power engineering market in Russia are connected with the plans for introduction of new generating capacities which are defined in the basic provisions of the «Energy strategy of Russia for the period up to 2030», approved in 2009, and corrected in 2010. in «General scheme of accommodation of objects of electric power industry in Russia up to 2020 with perspective up to 2030» of the Ministry of energy of Russia, as well as the business program of the state corporation «Rosatom» on a long-term period (2009–2015) for the nuclear power industry.

General scheme of accommodation of electric power industry objects in Russia fixes the key provisions of the requirements to the volume of the production capacities and necessary technologies:

entering of not less than 4 GW per year;

the transition to a steam-gas cycle, decommissioning of outdated steam power equipment. The development of gas turbines production with the capacity 65–350 MW and PSU on their basis with the capacity 400–1000 MW;

the transition to clean coal technologies (including on coal-fired power units with the capacity 330 and 660 MW on the ultra supercritical steam parameters, PSU with gasification of coal);

the development of typical co-generation systems including half-power on the basis of GPU-, GTU-, PGU-CHP (with specific electricity generation with consumption 1200 to 1500 kWh/Gcal);

minimization of various equipment, modular delivery, type design;

the creation of intellectual networks (SMART GRID). At the first stage the development of electrical networks on the basis of digital technologies, DC systems, flexible AC system with devices vector control is being planned;

increasing the usage of alternative renewable energy sources;

the development of the directions of service and modernization, and the others [1].

The analysis determined the investment program. It provided realization of more than 100 investment projects with the total volume of input of generating capacities NPP, hydroelectric power station, hydroelectric pumped storage power station, thermal power plants, and renewable energy sources for the period 2010–2030 as amended by 161.3 mln KW. The total investments will amount to 20 bln rubles (in the prices of 2009) to implement the General scheme of the electric power industry development, from them of 9.8 bln rubles for the improvement of power plants. The plans of the government of the Russian Federation take into account the tendency of increasing the capacity of the world's energy system. Accordingly domestic companies should take 15 % of the global market of electrical and engineering goods by 2030.

The role of the energy engineering industry will increase in the forthcoming period to solve the problems of energy development, first of all the replacement of physically worn out and obsolete equipment, to prescribe expectancy as well as the creation of cost-effective power equipment on the basis of high-performance environmentally energy processes.

The maximum unification of the power units is assumed in the document «Main provisions of the technical policy in the electric power industry of Russia for the period up to 2030» developed by RAO «UES of Russia» with RAS. It will increase the mass production of their construction, and therefore the serial production of the equipment for power plants. It is planned to reduce the number of types of turbines for thermal power plants in three times and produce 11 types of units: 7 types – for gas and 4 types for coal-fired turbines. Serial production will allow reducing the terms of manufacturing of the main energy equipment on 30 % and its cost reducing on 20 % compared with piece order. This will allow saving significant funds in scales of the global energy system.

«The Program of activity of the state Corporation for atomic energy «Rosatom» for a long-term period up till 2015» was adopted in the field of nuclear energy in 2008. According to this program 5 nuclear power plants should be constructed up to 2015 and 8 power units installed on them with the total capacity of 12.3 mln kW. However, the General scheme provides development of 11 new sites with placing on them 26 units with the total capacity of 2,.0 mln kW up to 2030. The amount of recommended commissioning of generating capacities of the nuclear power plants is defined in the amount of 37 units with the total installed capacity of 40.3 mln kW up to 2030. Two units will be put into operation on the floating nuclear power plant (FNPP) [5].

The technological development of power engineering plays a crucial role in the innovative development of the country, as directly linked to the realization of a number of national priorities of the scientific and technological development.

«The Strategy of development of power engineering of Russian Federation for 2010–2020 and on prospect up till 2030» was adopted in 2011 [1].

The realization of the Strategy will be implemented in three stages:

1 stage (2010–2016). The system of innovative development of the power industry is formed on the basis of scientific-technical and innovation potential of the country's power engineering. Technical re-equipment of the enterprises of the power engineering industry is planned to produce the unified power equipment competitive in the domestic market.

2 stage (2017–2020). The serial production of competitive products in the world market of power engineering should be organized. The share of power units with the use of imported equipment should draw up to 2015 no more than 40 %, further to be sustained at the level of 10–15 %.

3 stage (2021–2030). To meet the domestic needs in power engineering production, gaining 15 % of the world market.

The Ministry of industry and trade of Russia estimates forecast financing of actions of the Strategy in the amount of 157.37 bln rubles in the prices of the corresponding years at the expense of all sources of financing for the period up to 2020. including the accounts of the funds of the Federal budget 22.33 bln rubles for a period of 2021–2030 – 155 bln rubles, including 15.6 bln rubles at the expense of funds of the Federal budget.

The nearest plans for the power engineering development should provide for every eventuality investment climate improvement in the innovative field.

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