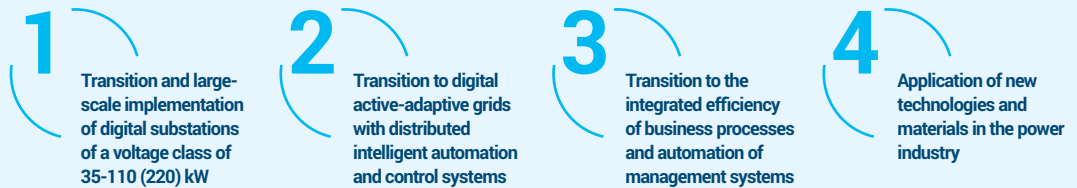


Innovative activities

Key areas of the Innovative Development Program of PJSC IDGC of Siberia



COSTS OF THE MAJOR INNOVATIVE ACTIVITIES

Item No.	Directions of innovative development	Planned costs, mln rub. (net of VAT)	Actual costs, mln rub. (net of VAT)
1	Transition to digital substations of various voltage classes	Not planned	0
2	Transition to digital active-adaptive grids with distributed intelligent automation and control systems	1,162.30	1,175.69
3	Transition to the integrated efficiency of business processes and automation of management systems	161.85	175.2
4	The use of new technologies and materials in the power industry	15.15	15.44

The costs for the purchase of innovative products (technologies, solutions, goods, works, services, determined by the approved innovative development program of PJSC IDGC of Siberia) in the reporting year were:

- The planned value – 1,339.3 mln rub. excluding VAT
- The actual value – 1,366.33 mln rub. without VAT

In the direction **“Transition to digital substations of various voltage classes” in 2018, PJSC IDGC of Siberia launched the implementation of pilot projects “Digital Substation”:**

- Reconstruction of the 35/10 kW Substation Prudskaya (Altaiergo)
- Reconstruction of the 35/10 kW Omskaya substation (Omskenergo)
- Reconstruction of the 35/10 kW Verkh-Chita substation (Chitaenergo)

The goal of these innovative projects is to create substations with a high level of automation of technological process management, equipped with developed information technology and control systems and facilities (Automated system of monitoring and diagnostics, Automated system of technological process management, automated measuring and information system for electric power fiscal metering, Coefficient of ecological and economic effect, Relay Protection and Automation Devices), in which all the processes of information exchange between substation elements and external systems, as well as substation operation control are carried out in digital form based on IEC protocols. At the same time, the primary power equipment of the digital substation and the components of information technology and control systems will be functionally and structurally oriented to support digital data exchange.

In 2018, PJSC IDGC of Siberia concluded contracts for the design and exploration work. The completion of activities on pilot projects Digital Substation is scheduled for 2020-2021.

In the framework of the direction of innovation development **“Transition to digital active-adaptive grids with distributed intelligent automation and control systems”, in 2018, PJSC IDGC of Siberia launched the implementation of pilot projects of “Digital PDZ”:**

- Pavlovsky Distribution Zone, Production Department Central Electric Grids, pilot zone of distribution grids from Pavlovskaya 110/10 kW substation (Altaienergo)
- Pribaykalsky Distribution Zone of Production Department BES, pilot zone of distribution grids from 110/35/10 kW substation Pribaykalskaya (Buryatenergo)
- Mayminsky Distribution Zone, pilot zone of distribution grids from 110/10 kW Substation Mayminskaya (Gorno-Altai Electric Grids)
- Yemelyanovsky Distribution Zone of Production Department KES, a pilot zone of distribution grids from 110/35/10 kW Ozernaya substation (Krasnoyarskenergo)
- Topkinsky Distribution Zone, Production Department of North-Eastern Electric Grids, pilot zone of distribution grids from 35/10 kW substation Shishinskaya (Kuzbassenergo RES)
- City RES of POS ZES, a pilot zone of distribution grids from 35/10 kW substation Omskaya (Omskenergo)
- Chita Distribution Zone of Central Electric Grids, pilot zone of distribution grids from 35/10 kW Verkh-Chita substation (Chitaenergo)
- Ust-Abakansky Distribution Zone, pilot zone of distribution grids from Kalininskaya 110/10 kW substation (Khakasenergo)

The goal of these projects is to create a highly automated distribution electrical grid, ensuring observability and controllability through digital communication systems and equipment, supporting IEC protocols, controlled in real time and tracking the parameters and modes of operation of all participants in the transmission and consumption of electrical energy, supporting self-diagnosis functions and self-healing, ensuring the functioning of the energy management system Blain, intelligent adaptation modes of operation and automatic modes of synchronization with consumers and distributed generation devices, as well as keeping the intelligent consumed and the produced electric energy.

In 2018, all branches of the Company signed contracts for the design and exploration work. The completion of measures for the pilot projects of the **“Digital PDZ”** is scheduled for 2020.

Also within the framework of this direction, in the reporting year, a comprehensive innovative project **“Creation of smart electricity metering systems, with the possibility of integration into a unified management system providing remote control functions and issuing information about grid operation parameters”** was carried out.

In 2018, an innovative project **“Intelligent switching devices (reclosers) 6-35 kW with integrated connection controllers and the possibility of combining into a single management information system”** was also carried out, the purpose of which is to introduce elements of an active-adaptive grid with a distributed intelligent control system (recloser) requiring maintenance and repairs, with high performance and telecontrol and alarm system, which increases reliably to electricity consumers and power quality, reduced operating costs.

Within the framework of the **“Transition to the integrated efficiency of business processes and automation of management systems”, in 2018, a comprehensive innovative project “Modernization of operational hardware and software complex to provide dispatch, technological and situational management (SCADA)”** was carried out, the purpose of which is to create the ASTU software and hardware complex (DMS, OMS, GIS), using a single information model of the electrical grid, providing reception, storage, display, processing and analysis of all types of operational and non-operational tons lemetrical information, manual input data, information received from adjacent technological and corporate automation systems for managing the operation and development of the electrical grid, as well as providing remote monitoring and dispatcher control functions for power facilities to automate the process of collecting and displaying information on the state of the primary equipment of the power grid complex, to quickly determine the location of the accident, which in turn will reduce the interruption of power supply and smart It is time to eliminate technological violations.



In 2018, in the branch of PJSC IDGC of Siberia Omskenergo, the project **“The use of new technologies and materials in the power industry”** was carried out on the reconstruction of Substation Tara with the installation of a 110 kW controlled shunt reactor. This measure is necessary to normalize and smoothly regulate voltage levels on buses of 110 kW substations in the northern regions of the Omsk region, where the voltage levels in some substations exceed the permissible values and do not meet the requirements of the international standard IEC 38-83. The installation of a controlled shunt reactor at the 110 kW Tara substation will reduce electrical energy losses in 110 kW grids.

COOPERATION WITH HIGHER EDUCATION ESTABLISHMENTS

In PJSC IDGC of Siberia, there are 13 cooperation agreements with universities of the Siberian region providing training in electric power specialties. The key partners of the Company are:

1. FSBEI of HE Altai State Technical University. I. I. Polzunova, Barnaul
2. FSBEI of HE East-Siberian State University of Technology and Management, Ulan-Ude
3. FSBEI of HE Kuzbass TF Technical University Gorbachev, Kemerovo
4. FSAEI of HE Siberian Federal University, Krasnoyarsk
5. Khakassky Technical Institute – a branch of FSAEI of HE Siberian Federal University and FSBEI HPE KSU named after N.F. Katanova, Abakan
6. FSBEI of HE Omsk State University of Communications, Omsk
7. FSBEI of HE Omsk State Technical University, Omsk
8. Federal State Budgetary Educational Institution of Higher Education Transbaikalian State University, Chita
9. FSBEI HE Irkutsk National Research University, in respect of which the Company performs the functions of coordinator of interaction with companies of the Rosseti Group

In the partner universities there are basic departments created with the assistance of the Company

- Branch of the Department Power supply of industrial enterprises of the Altai State Technical University. I. I. Polzunova on the basis of the branch of PJSC IDGC of Siberia – Altaienergo
- Branch of the Department Power supply of mining and industrial enterprises of the Kuzbass State Technical University. T. F. Gorbachev on the basis of Kuzbassenergo-RES, a branch of PJSC IDGC of Siberia
- The base department of the Omsk State University of Communications on the basis of the branch of PJSC IDGC of Siberia – Omskenergo
- The base department of Electric Power Industry of the Khakass Technical Institute – a branch of the Siberian Federal University on the basis of the branch of PJSC IDGC of Siberia – Khakasenergo

In accordance with the Order of PJSC ROSSETI dated October 6, 2016 No. 426r “On Approval of the Concept of Interaction of Companies of the ROSSETI Group with Educational Organizations”, IDGC of Siberia approved a Program of Interaction with Educational Institutions, the purpose of which is to implement a systematic approach to interacting with educational institutions, and providing following areas of work:

- Career guidance activities
- Organization of work of student energy groups
- Organization of practice of students, including paid
- Targeted training in universities in the framework of budgetary places and providing scholarship support to target groups
- Participation in educational activities – updating of curricula, the formation of the subject of final qualification works, participation in state examination commissions
- Organization of internships for teachers at the Company facilities
- Participation in the modernization of educational bases – equipping classrooms, laboratories, departments
- Attracting students and teachers of educational institutions to competitions of scientific works conducted by the Company
- Training and advanced training of the Company employees

INNOVATION DEVELOPMENT PLANS

In accordance with the R&D Program, in 2018 the following activities were performed at PJSC IDGC of Siberia:

- Research Formation of an electronic database of energy supply facilities at remote, including those without technological connection with the energy infrastructure of the territories located in the area of responsibility of PJSC IDGC of Siberia and the development of methods for integrated power supply solutions based on distributed energy sources, including the number of renewable
- Research Study of the complex of technical solutions necessary for the implementation of technological connection of generating plants to the 6-20 kW electrical grid;
- Research Development of a unified integration platform of information systems of PJSC IDGC of Siberia

2018 RESULTS

In 2018, three licensing agreements were signed on the use of R&D results of PJSC IDGC of Siberia:

1. License agreement dated January 26, 2014 No. 43.4000.48.18 with LLC Plant of Metal Structures of Siberia (LLC ZMK of Siberia) for the right to use the utility model Fast-mounted power transmission line support
2. License agreement No. 43.4000.477.18 dated November 23, 2014 with SevZapRegionStroy LLC for the right to use the rights to utility models "Mushroom foundation with keyway of the support plate and stand" and "Mushroom foundation with the bolt joint of the support plate and rack"
3. License agreement dated November 11, 2018 No. 43.4000.457.18 with PJSC Uyarzhelezobeton (PJSC UZhBK) for the right to use the utility models Mushroom foundation with keyway and base plate spigot and Mushroom foundation with bolt joint of the base plate and rack

Cost structure of the Innovation Development Program, mln rub.

Name of the indicator	2016	2017	2018	2018 (plan)	2019
Energy efficiency improvement	-	-	-	-	-
Development of new technologies in production	-	13.26	15.44	15.15	125.21
Quality control system	-	-	-	-	-
Cooperation with universities and research organizations	2.08	1.59	2.05	0.6	0.6
Modernization of existing facilities	-	-	-	-	-
R&D plan	4.82	29.15	43.15	45.15	63.09

Purchases of innovative products

Name of the indicator	2016	2017	2018	2018 (plan)	2019
Volume of purchases of innovative products/services, mln rub	452.17	688.25	1,366.33	1,339.30	926.72
Share of purchases of innovative products/services in total purchases, %	8.20	9.34	10.10	4.00	4.00
Number of patents	117	116	113		