

INNOVATIONS

The Board of Directors has adopted the PAO Rosseti Ural's Innovation Development Program for 2024-2029 to be potentially extended until 2035 and mid-term implementation plans for 2024 and 2025-2029³⁰. The goal of the Company's Innovation Development Program is to enhance reliability, quality and efficiency of supply to consumers by upgrading grids through innovative technologies and transforming them into the intelligent core of the energy sector's technological infrastructure.

The final results are:

- provision of high reliability of electricity supply
- enhancement of efficiency through reduction of losses, expenses and implementation of innovations in electricity transmission, maintenance and repairs of the Company's grids
- increase of investment attractiveness and value of the Company

In 2024, expenses on the activities from the IDP exceeded the targets. Total expenses in 2024 totaled RUB 1,216.12 million (target – RUB 999.54 million), completion of the IDP totaled 121.67%.

2024 achievements are:

1. TRANSITION TO 35-110(220) KV DIGITAL SUBSTATIONS

The goal is to create grid facilities with intelligent control and management system by installing state-of-the-art equipment and systems as well as to use IEC 61850 data transfer protocols. Effect from the deployment of the "Digital Substation" technology: increased level of automation and controllability, reduced exploitation costs due to extended repair intervals, usage of low-maintenance equipment, reduced time for restoration of normal network operation, reduced possibility of incidents and damages of equipment, usage of network fault location and remote switch control system.

The "Digital Substation" technology is planned to be deployed on the following pilot substations:

1) 110 kV Esaulka substation (Chelyabenergo branch).

The implementation of the project shall enable to ensure:

- a possibility to connect new consumers and increase net supply;
- an increase of supply reliability and voltage quality;
- upgrade of obsolete equipment;
- achievement of optimal load;
- an increase in observability and controllability of the facility, testing of IEC 61850-compliant solutions using microprocessor-controlled RPA devices and telematics, supporting "digital substation" technology.

2024 achievements: DSW in progress. 2024 expenses: RUB 0.4 million (target value) and RUB 0.0 million (real value). Deviation from the target value is due to prolonged approval of technical documentation concerning the phased implementation of the project. The execution is scheduled to take place in the volumes of future periods.

2) 110 kV Chekmash substation (Sverdlovennergo branch).

Innovative technologies implemented: i) intelligent electronic devices (digital relay protection and automation; ACSC), supporting IEC 61850-compliant digital data exchange; ii) analytical decision support system based on information from PMU and SCADA devices; iii) information security systems of facilities of crucial information infrastructure; iv) remote control of grid facilities through automated switch programs; v) intelligent accounting infrastructure (AMI).

2024 achievements: DSW, procurements, CAW ended. 2024 expenses: RUB 87.6 million (target value), RUB 87.85 million (real value).

2. TRANSITION TO DIGITAL SMART GRIDS WITH DISTRIBUTED INTELLIGENT AUTOMATION AND CONTROL SYSTEM

2024 achievements:

1) Deployment of projects on the roll-out and development of smart metering (0.4-110 kV) in Permenergo, Chelyabenergo and Sverdlovennergo.

The goal of the project is to create a customer-centered automated metering system with smart metering functions (remote reading of metering parameters, incl. billing and load limitation/disconnection; remote collection of consumption data; multi-tariff function; monitoring of meter status; data exchange).

Innovative technologies implemented:

- Smart metering system is based on the usage of smart meters united into one system of automated control and recording. To get the system working, a new-generation meter is mounted on a power line tower. The meter transfers consumption metrics to the dispatcher and customer's display. Two-way GSM/GPRS communications enable to monitor the system in real time, control electricity supply and rapidly detect losses and attempted electricity thefts. Alongside with the installation of the automated metering system, cable entrance points are reconstructed: old-generation wires are replaced with self-supporting insulated wires, which provides higher quality of energy supply and reduces unauthorized connections to zero. Implementation of state-of-the-art automated systems of control and recording of electricity consumption makes it possible to arrange remote metering on any facilities and perform remote switching off/on;
- Customer services and CRM (management of electricity supply and demand).

Effects from implementation: i) reliable metering at points of delivery at responsibility boundaries of multi-family and single-family houses; ii) reliable metering at points of delivery for consumers connected to networks with peak losses and consumption; iii) location of electricity loss centers through upgraded metering systems on 6(10)/0.4 kV substations making it possible to prepare balances of main substations with problematic feeders; iv) minimization of expenses on metering automation (per a metering point).

2024 achievements: i) exclusion of in-house losses (in multi-family houses) from electricity purchased to compensate losses; ii) reduction of losses on selected network sections (by enhanced accuracy of metering and reduced unmetered consumption); iii) growth of net supply (same as previous, plus monthly billing using metered values as of the end of each calculation period); iv) reduction of operating expenses related to meter maintenance (manual data collection, manual data input, instrumental inspections).

2024 Permenergo's expenses totaled RUB 427.64 million (target values) and RUB 399.05 million (actual values); 2024 Chelyabenergo's expenses totaled RUB 125.44 million (target values) and RUB 158.24 million (real values); 2024 Sverdlovenegero's expenses totaled RUB 215.72 million (target values) and RUB 199.05 million (real values).

3. TRANSITION TO END-TO-END PERFORMANCE OF BUSINESS PROCESSES AND AUTOMATION OF CONTROL SYSTEMS

2024 achievements:

1) Development of the GIS Ural geoinformation system

Goals of the project: i) enhancement of management efficiency by creating an integrated geo-oriented cross-functional area for interaction among structural units with the straight reporting line to the Chief Operating Officer; ii) creation of a unified center for visualization of information on grid infrastructure (100% of grid facilities).

In 2024, the design work was carried out to expand the functional capabilities of the GIS Ural system, focusing on the needs of the technical unit and the technological connection unit in terms of grid planning tools and long-term development. Additionally, improvements were made to the existing system to enhance its performance and functionality.

2024 expenses totaled RUB 15.82 million (target value) and RUB 34.12 million (actual value), the odds are due to the implementation of additional system enhancements aimed at expanding the range of functionalities and usage scenarios.

2) Automation of sales and metering through the Omni-US automated information system.

Goals of the project: i) enhancement of transparency and controllability of business processes through unification of information and business processes, maintenance a unified database of consumers and their delivery points, cost-cutting; ii) Compliance with requirements³¹ for providing access to a minimum set of functions of intelligent electric energy (power) metering systems.

2024 achievements: i) commissioning of the basic version; ii) Design, implementation of technical specification requirements, and commissioning of the "Mobile Services" Control and Monitoring System (CMS) based on Aurora OS; iii) Report Configuration (15 Templates); iv) integration with Krona automated system; v) Design and Development of Architectural Solutions and Information Security Subsystems; vi) Designing integration, coordinating enhancements and integration features with the digital meter reading service, and conducting commissioning and startup operations; vii) system support management.

2024 expenses totaled RUB 36.36 million (target value) and RUB 52.64 million (real value), the increase in real values impacted by types of works, slated for implementation in 2025.

3) Roll-out of the security system for crucial information infrastructure.

Goals of the projects: i) Ensuring the resilient operation of critical information infrastructure facilities amid cyberattacks; ii) Reducing risks from potential destructive impacts on the Company's information resources; iii) compliance with the laws of Russia, stipulating procedures ensuring information security of crucial information infrastructure and volume of information protected by the law.

Key objects protected under the project are: i) technological and corporate information systems; ii) automated system of technologic management; iii) technological and corporate data transmission networks.

2024 expenses totaled RUB 203.89 million.

4. APPLICATION OF THE LATEST TECHNOLOGIES AND MATERIALS

1) Creation of the EV charging infrastructure

In 2024 and 2025, the initiative stipulated creation of the EV charging infrastructure, in particular, construction of quick EV charging stations as well as upgrade of existing charging stations to ensure secure communication channels supported by the OSCP data. 2024 expenses totaled RUB 10.47 million (target value) and RUB 0.01 million (real value), the odds are due to exclusion of projects related to the creation of the EV charging infrastructure from the investment program as a result of reduced costs on maintenance and exploitation as well as long-term approval of technical documentation. Facilities under the initiative were also excluded from the 2025 investment program.

5. EVOLVEMENT OF THE SYSTEM ON DEVELOPMENT AND IMPLEMENTATION OF INNOVATIVE PRODUCTS AND TECHNOLOGIES, R&D ACTIVITIES

There were 3 R&D works in progress in 2024:

1) Research Project "Development of a model for adaptive regulation of voltage in distribution networks to enhance net supply and reduce losses, taking into account static load characteristics" (performed by FGAOU VO UrFU named after B.N. Eltsyn).

2024 achievements:

- Execution: RUB 1.0 million (target value) and RUB 1.0 million, no VAT (real value);
- Funding: RUB 6.0 million (target value) and RUB 6.0 million, no VAT (real value).

2024 outcomes of the R&D work: 1. A new approach has been developed to optimize the operating mode of the distribution network, taking into account advanced voltage regulation tools. 2. The typical static load characteristics by voltage have been defined based on the typification results of consumer groups and the execution of field experiments on voltage regulation prior to consumers' facilities. 3. A multi-criteria optimization model for the operation mode of the grids has been developed with the aim of increasing the net electricity supply, reducing load and power flows in specific sections, and minimizing transmission losses in the distribution network, taking into account the static characteristics of the load.

4. A technical specification has been prepared for the advanced development of the software support system for adaptive voltage regulation in the distribution network. Additionally, methodological guidelines have been developed to optimize the operational mode of the grids with the goals of increasing the net electricity supply, reducing load and power flows in specific sections, and minimizing transmission losses in the distribution network. These guidelines take into account the static load characteristics and are formalized as an organizational standard, prepared for approval in line with established procedures.

2) Research Project “Creation of a one-way system for locating a point of impact through analysis of time-symmetric functions using domestic components to be mounted on a 6–10 kV cable/aerial power line. Examination of impact of cable/aerial power line parameters when shaping its digital model on fault location” (performed by ANO VO Innopolis University).

2024 achievements:

- Execution: RUB 21.23 million (target value) and RUB 21.23 million, no VAT (real value);
- Funding: RUB 27.96 million (target value) and RUB 27.96 million, no VAT (real value).

Stage 2 achievements:

1. An experimental prototype of the fault location hardware and software package deployed at the site;
2. Project documentation, work execution plan, testing program and methodology;
3. A scientific technical report that includes results from field inspections and on-site testing, a description of the digital power line model, and analysis outcomes regarding: the impact of mathematical modeling methods of the digital power line model on the accuracy of fault location; the necessity of using an impulse generator for editing the digital power line model; and the conditions for the effective application of the fault location hardware and software package to identify fault locations on 6(10) kV power lines;
4. Version of the program for interaction between the fault location hardware and software package and SCADA.

3) Research project “Research and development of the system for monitoring 6–35 kV cable power lines with the use of Made-in-Russia NBPLC modems”. (Performed by OOO NPTs Prioritet).

2024 achievements:

- Execution: RUB 22.26 million (target value) and RUB 36.49 million or RUB 43.79 incl. VAT (real value);
- Funding: RUB 0.00 million (target value) and RUB 0.00 million.

Stage 1 and 2 achievements: report on the analysis of the impact of power cable insulation characteristics and partial discharges (PD) occurring within it on modem interaction signal parameters; report

on the study of various methods for analyzing cable line insulation features and techniques for identifying partial discharges; report on the development of a mathematical model describing the transformation of the PD impulse shape as it propagates along the power cable; report on the investigation of the feasibility of PD localization based on impulse shape analysis during propagation through cable lines and comparison with model data; report on thematic patent search; report on the development of cable insulation condition monitoring algorithms and software implementing these algorithms; program code; program description; design documentation for a prototype cable insulation condition monitoring system; design documentation for a test bench for laboratory testing of the prototype monitoring system; laboratory testing program and methodology for the prototype.

6. DEVELOPMENT OF INNOVATIVE DEVELOPMENT MANAGEMENT SYSTEMS AND SHAPING OF INNOVATIVE INFRASTRUCTURE

2024 achievements:

1) Application of the knowledge management system in a process model of technological and innovative development management.

The Company's knowledge data base is designed for searching, accumulating, storing, distributing and using knowledge by employees and for the functioning of professional communities (expert and practitioner communities).

2024 achievements: the KMS was put into commercial operation, with the Rospatent's certificate on registration of the software obtained.

2024 expenses totaled RUB 5.35 million (target value) and RUB 5.35 million (real value).

2) Supervisory control of the Company's management system in terms of its compliance with ISO 9001, ISO 14001, ISO 50001, ISO 45001 and certification of the IMS in terms of its compliance with GOST R 56273.1-2014/CEN/TS 16555-1:2013.

Goal of the project: provision of integration of the management system elements into the holistic system meeting requirements of international standards, improvement of innovative development management systems and enhancement of efficiency of the Company's business processes.

2024 achievements: supervisory audit in PAO Rosseti Ural, incl. Sverdlovennergo, Permenergo and Chelyabenergo, production departments and distribution zones. Compliance of the Company's integrated management system with ISO 9001, ISO 14001, ISO 50001, ISO 45001 confirmed, compliance of the Company's IMS with GOST R 56273.1-2014/CEN/TS 16555-1:2013 certified. 2024 expenses totaled RUB 1.5 million (target values) and RUB 1.5 million (real values).

Target and actual expenses in 2024

	Expense target value, RUB million, no VAT	Expense real value, RUB million, no VAT
Transition to digital substations	88.00	87.85
Transition to digital smart grids with distributed intelligent automation and control system	768.80	756.34
Transition to end-to-end performance of business processes and automation of control systems	52.19	290.64
Application of the latest technologies and materials	10.47	0.01
Evolution of the system on development and implementation of innovative products and technologies, R&D activities	64.49	58.72
Development of innovative development management systems and shaping of innovative infrastructure	6.85	6.85
Total	990.80	1,200.41

Indicator	2022	2023	2024	2024/2023, %
Expenses on innovations, RUB million	520.57	930.91	1,141.69	122.64%
R&D expenses, RUB million	20.08	21.86	58.72	268.61%

PROGRESS OF THE DIGITAL TRANSFORMATION PROGRAM

The Digital Transformation Program is prepared pursuant to the GK Rosseti's Digital Transformation Strategy and is its component. The Program defines the goals of digital transformation focused on achieving of the goals set forth by the Strategy, as well as DT-related projects and activities of PAO Rosseti Ural in 2022-2030.

Indicator	2022	2023	2024	2024/2023, %
Funding of Digital Transformation Program's activities, RUB million	193.00	262.48	734.42	280
Share of directors, specialists and clerks trained in digital competencies in line with adopted corporate standards or, in their absence, in line with Decrees of Ministry of Economic Development, in average headcount at the end of the reported period, %	5.0	4.8	5.7	18

The primary objective of the digital transformation and development of IT in the Rosseti Group is to enhance efficiency of performance and reliability of services, to change the logic of processes as well as formation of new services resulting from the implementation of digital technologies.

The key directions of the Program is compliance with laws on information security and implementation of import substitution policy, for example:

- Creation of a system of information security for facilities of critical information infrastructure
- Creation of an automated system for the management of financial and economic operations, based on a domestic platform
- Creation of an automated system for the management of production assets, based on a domestic platform
- Creation of an automated system "Wage and Personnel", based on domestic platform

