

INNOVATIVE ACTIVITIES

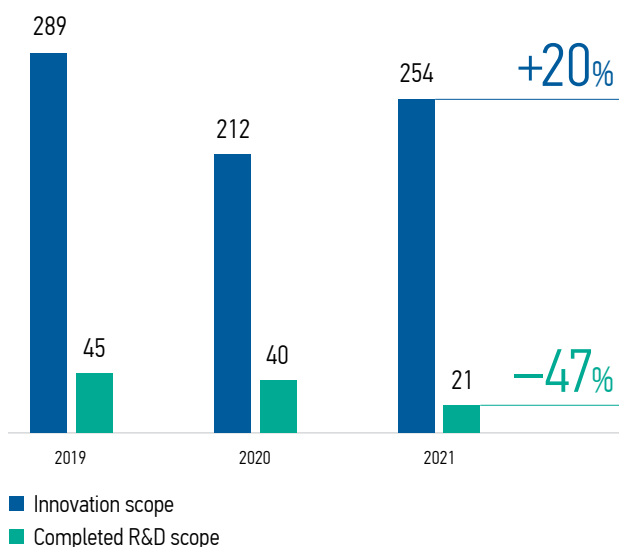
ON 30 MARCH 2021, THE BOARD OF DIRECTORS OF THE COMPANY DEFINED INNOVATIVE DEVELOPMENT WITH CONTROL OVER THE IMPLEMENTATION OF THE CURRENT INNOVATIVE DEVELOPMENT PROGRAMME AS THE PRIORITY AREA OF THE COMPANY'S ACTIVITIES (MINUTES NO. 426/2021).



Key areas of the Innovative Development Programme for 2020–2024, with an Outlook Until 2030, approved by the Board of Directors of Rosseti Kuban on 13 October 2021 (Minutes No. 450/2021):

- Transition to 35–110 (220) kV smart substations
- Transition to the grids featuring active adaptation and distributed smart automation and control system
- Transition to integrated efficiency of business processes and automation of control systems
- Application of advanced technology solutions and materials in power engineering
- Promotion of an innovative development management system and building an innovative infrastructure

DYNAMIC PROFILE OF KEY INDICATORS FOR INNOVATION ACTIVITIES OVER 2019–2021 (RUB MN)



THE COMPANY'S MAIN INNOVATIVE PROJECTS IMPLEMENTED IN 2021

Project	Project implementation
Creation of a smart metering system in the branches of PJSC Rosseti Kuban	<p>Implementation time-frame: 2020–2030</p> <p>In the reporting period, innovative smart metering devices were introduced in all 11 branches of PJSC Rosseti Kuban.</p> <p>Smart metering devices are integrated across the Company within the Investment Programme of PJSC Rosseti Kuban to create a metering system as part of the implementation of Federal Law No. 522-FZ dated 27 December 2018 On Amendments to Certain Legislative Acts of the Russian Federation in Connection with the Development of Electricity (Capacity) Metering Systems in the Russian Federation. In the reporting year, the introduction of smart metering devices was carried out, inter alia, as a part of the grid connection procedure for new consumers of a capacity of up to 15 kW. The project aims to create a smart metering system and integrate it into the innovative systems being established: supervisory control and data acquisition (SCADA), distribution management (DMS), and outage management systems (OMS).</p> <p>Planned effect:</p> <ul style="list-style-type: none"> • Reduced operating costs by taking the readings and power supply parameters of electricity consumers remotely • Possibility of remote restriction and resumption of power supply to electricity consumers
Digital Labinsk 2 — Sovetskaya 110 kV overhead line	<p>Implementation time-frame: 2021–2025</p> <p>Design and survey were carried out in the reporting year.</p> <p>During the construction of the Labinsk 2 — Sovetskaya 110 kV overhead cable line, it is planned to use innovative wire and lightning protection cable and an optical system for monitoring the condition of the wires.</p> <p>Planned effect:</p> <ul style="list-style-type: none"> • Enhancement of the technical parameters of the line without changing its configuration • Increased reliability
Introduction of charging stations for electric vehicles in branches of PJSC Rosseti Kuban	<p>Implementation time-frame: 2021–2025</p> <p>On 13 October 2021, the Board of Directors approved the Charging Infrastructure Development Programme.</p> <p>The objectives of this Programme are as follows:</p> <ul style="list-style-type: none"> • Development of non-tariff revenues and provision of new services to consumers • Improvement of the environmental situation • Provision of a wide range of electric vehicle owners with the necessary charging infrastructure • Establishment of a transport corridor for electric transport through the Krasnodar Territory to the Crimean peninsula, with an extensive grid of electric charging stations • Support to the introduction of public electric transport in the major cities of the Krasnodar Territory (Krasnodar, Sochi) • Large-scale introduction of autonomous electric vehicles • Increased volume of electricity delivery • Higher customer loyalty and promotion of Rosseti Kuban's brand <p>Planned effect: implementation of the programme will allow Rosseti Kuban to become a major player in the charging infrastructure market for electric vehicles by 2025, as well as the driver of both innovative solutions and technologies and legislative initiatives in this regards in the Krasnodar Territory and the Republic of Adygea.</p> <p>In the reporting year, three 120 kW Relevant MAX charging stations were purchased for installation in the following branches of Rosseti Kuban: Krasnodar Power Grids, Sochi Power Grids and Slavyansk Power Grids</p>

RESEARCH AND DEVELOPMENT

AMONG OTHER THINGS, THE COMPANY'S INNOVATIVE DEVELOPMENT PROGRAMME FOCUSES ON RESEARCH AND DEVELOPMENT (R&D), NAMELY PROMOTION OF CUTTING-EDGE TECHNOLOGY TO CREATE FUNDAMENTALLY NOVEL METHODS, AS WELL AS APPLIED RESEARCH DESIGNED TO IMPROVE THE EXISTING TECHNOLOGY.

Seven R&D projects were completed in 2019–2021. In 2021, phases of four R&D projects were accepted.

RESULTS OF R&D ACTIVITIES IN 2021

R&D description	Results
Transition to smart 35–110 (220) kV substations	
Development of a unified IoT-platform ¹ for dispatching data about the status of substation equipment	<p>Implementation time-frame: 2021–2023</p> <p>The following technical results were obtained:</p> <ul style="list-style-type: none"> • Patent surveys, including patent landscapes based on the surveys carried out • Specifications • Requirements for a unified IoT-platform: <ul style="list-style-type: none"> – Classification and analysis of approaches to the establishment of a unified IoT-platform depending on an existing state of substation equipment – The general principles of the establishment of a unified IoT-platform – Area of rational (effective) application of a unified IoT-platform – An algorithm for selecting the optimum configuration when designing basic technical solutions for the design of a unified IoT-platform • A pilot site (implementation site) was agreed to undergo pilot testing
Transition to integrated efficiency of business processes and automation of control systems	
Study of the increment rate of key forest-forming tree species depending on climatic zones and soil quality along the routings of operating overhead lines with the preparation of regional maps for regular clearing of overhead line right-of-ways and provision of recommendations on technique of works	<p>Implementation time-frame: 2020–2022</p> <p>The following technical results were obtained:</p> <ul style="list-style-type: none"> • R&D Report “Characteristics of forest vegetation necessary to determine the rate of overgrowth of overhead line breakthroughs and to develop recommendations on the frequency and methods of clearing the overhead line breakthroughs” • R&D Report “Effectiveness of existing methods of clearing routes from woody and shrub vegetation (in terms of the impact of clearing methods on annual woody and shrub vegetation growth)” • Digital layers of geo-information databases on forest vegetation characteristics required to determine the rate of overgrowth of overhead line breakthroughs and to recommend the frequency and methods of clearing

¹ Internet of Things (IoT) is a set of physical objects connected to the Internet and exchanging data.

An IoT-platform is software designed to connect the Internet of Things (sensors, controllers and other devices) to the cloud and access them remotely. It is a mediator between the hardware level (sensor level) and the application level.

R&D description	Results
<p>Development of a software package for the assessment and prediction of the technical condition and propagation of defects in 35–110 kV power transformers based on measurements performed by the Automated Monitoring and Diagnostics System and Production Asset Management System (PAMS) data with the issuance of recommendations to the operating personnel</p>	<p>Implementation time-frame: 2021–2023</p> <p>The following technical results were obtained:</p> <ul style="list-style-type: none"> • Report on patent searches and patent surveys • Pre-design survey at the 110 kV Afipskaya substation and at the executive office of PJSC Rosseti Kuban • Work project at the 110 kV Afipskaya substation and at the executive office of PJSC Rosseti Kuban • Specification of equipment and licences • Report on the installation of the hardware and server components of the automated monitoring and technical diagnostics system • Software of the forecasting package • Package of operational and programming documentation for the forecasting software package • User manual for the forecasting package and Automated Monitoring and Diagnostics System (ASMD) software • Report on PAMS updating • Guidelines with general description of the expert models used and recommendations for interpreting the results of the expert models
<p>Automated classification of accidents based on machine learning methods</p>	<p>Implementation time-frame: 2021–2023</p> <p>The technical results are as follows:</p> <ul style="list-style-type: none"> • Report on patent searches and patent surveys • R&D report containing the following details: <ul style="list-style-type: none"> – The results of survey and refinement of information security incident recording and management processes – Classes of the target set of information security incident attributes – An initial set of data describing the behaviour of the nodes on the local area network and the actions of users – The level of accuracy of the ML-algorithm² results – Requirements for the preparation of historical data on local area network node behaviour and user activity – The functional and technical requirements for selecting and configuring ML algorithms agreed with the customer – A register of risks and monitoring procedures

In 2019–2021, nine documents of copyright protection were obtained: five state registration certificates for computer programmes, three patents for inventions and one patent for utility models.

Four licensing agreements were concluded for R&D results; four results were introduced into production activities of Rosseti Kuban.

² A machine learning (ML) algorithm is a process or set of procedures that help a model adapt to data with a given purpose.

COMPANY'S EXPENSES FOR INNOVATIVE DEVELOPMENT

EXPENSES FOR THE KEY INNOVATION DEVELOPMENT AREAS IN 2019–2021 (RUB MN, EXCL. VAT)

Innovative development focus areas	2019 (actual)	2020 (actual)	2021 (plan)	2021 (actual)
Transition to smart 35–110 (220) kV substations	250.30	29.30	59.10	0.00
Transition to the grids featuring active adaptation and distributed smart automation and control system	0.00	180.15	184.30	229.10
Transition to integrated efficiency of business processes and automation of control systems	37.80	0.00	28.30	13.40
Utilisation of new technology solutions and materials in power engineering	0.50	2.32	15.60	11.40
Promotion of an innovative development management system and building an innovative infrastructure	0.00	0.64	6.56	4.20

INTEGRATED APPLICATION/IMPLEMENTATION OF (NEW) DIGITAL TECHNOLOGIES

ON 12 MAY 2021, THE BOARD OF DIRECTORS OF THE COMPANY APPROVED THE UPDATED PROGRAMME — DIGITAL TRANSFORMATION OF ROSSETI KUBAN UNTIL 2030 (MINUTES NO. 431/2021 DATED 14 MAY 2021). THE PROGRAMME DEFINES THE AIMS AND OBJECTIVES, THE BASIC PRINCIPLES OF THE INTEGRATED APPLICATION/INTRODUCTION OF (NEW) DIGITAL TECHNOLOGIES, A LIST OF PILOT PROJECTS AND INFORMATION ON THE MANAGEMENT OF SUCH ACTIVITIES.

The objective of digital technologies application and introduction is changing the logics of processes and transition of the Company to risk-oriented management based on digital technologies and big data analysis.

The objectives of digital transformation are as follows:

- Making the Company's more adaptable to new tasks and challenges
- Improving the reliability performance of electric power supply to consumers
- Enhancing the Company's operational performance
- Expanding the availability of the power grid infrastructure
- Developing human resources and new competencies
- Diversifying the Company's business through additional services

The Company plans to implement the following activities:

- Optimisation and/or modification of process logic as a result of digital technologies introduction
- The creation of a unified digital process data environment will enable analytical studies for optimal management decisions, as well as analysis of information on the condition of equipment, forecasting the probability and consequences of failures — to reduce the risks of equipment failure through timely targeted repair or replacement
- The creation of a single digital model of the grid

The Innovative Development Programme of Rosseti Kuban for 2020–2024, with an Outlook Until 2030, includes digital transformation projects with the highest innovation component.

The 110 kV Labinsk 2 — Sovetskaya digital overhead line project has been piloted under the digital transformation programme. The following innovative solutions and technologies are planned within the framework of the said project:

- Introduction of an innovative wire
- Lightning protection cable made of steel clad aluminium wires
- Optical monitoring system
- System for distributed temperature control and condition monitoring of optical fibres in lightning rope
- Specialised system for lightning monitoring and forecasting of thunderstorms and analysis of lightning outages on overhead lines

VOLUME OF FINANCING FOR DIGITAL TRANSFORMATION PROGRAMME ACTIVITIES IN 2019–2021 (RUB MN)

