

ENSURING RELIABLE AND EFFICIENT OPERATION OF THE POWER SYSTEM



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In 2021, PJSC Rosseti Kuban generally achieved the main objective of production activity: maintaining the power equipment reliability at an adequate level. The Company completed the repair programme in full; it implemented a set of measures to improve the reliability of electricity supply to consumers in the Krasnodar Territory and the Republic of Adygea; the certificate of readiness to work in the 2021/2022 heating season was obtained.

In the grids of 110 kV and above, the number of technological disturbances decreased by 3%.

The Company's reliability indicators (I_{SAIFI} , I_{SAIDI}) did not exceed the planned values set by the Regional Power Commission — the Price and Tariff Department of the Krasnodar Territory for the reporting year, taking into account the permissible deviation”.

ENSURING HIGH-QUALITY, RELIABLE, AND UNINTERRUPTED POWER SUPPLY TO CONSUMERS

COMPANY RELIABILITY INDICATORS (I_{SAIDI} , I_{SAIFI}) ACHIEVED IN 2021

| Indicator | Values established by the Regional Power Commission — the Price and Tariff Department of the Krasnodar Territory | | The value achieved by Rosseti Kuban |
|--|--|---------------------------------------|-------------------------------------|
| | Plan | Plan, including permissible deviation | Actual |
| Average power outage duration, per point of delivery (I_{SAIDI} ; h) | 4.3800 | 5.6940 | 4.0939 |
| System average interruption frequency, per point of delivery (I_{SAIFI}) | 1.0101 | 1.3131 | 1.2873 |

The 2021 Maintenance and Repair Programme for the main energy system processes was implemented fully and on time; for the main nomenclature items, it was fulfilled by more than 100%. In order to ensure unconditional reliability of the power system operation, additional work was carried out on electricity transmission lines and substations, including the elimination of defects detected as a result of inspections and tests. The additional work was made possible thanks to the prompt reallocation of the expenditure limits of the maintenance and repair fund, for 2021.

The main activities completed in 2021 were aimed at:

- Maintaining the rated parameters of production assets — power transmission lines, substation equipment, and RPA devices
- Timely identifying and eliminating defects based on the power equipment diagnostics results
- Ensuring readiness for preventing and eliminating the technological disturbances
- Prolonging agreements concluded with contractors and related power grid companies, as well as with the Russian Ministry of Emergency Situations and the Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet)
- Ensuring the readiness of 402 teams, 1,803 employees, 742 units of equipment, including 22 mobile teams (123 employees) equipped with appropriate technical means (49 units, including 22 motor vehicles and 27 units of special equipment), tools, rigging, spare parts, communication aids, special clothing, catering rations, and financial assets
- Completing the emergency reserve of the Company
- Checking the readiness for use of 121 emergency power supply (EPS) sources with a total capacity of 13,522.5 kW, of which 110 mobile EPSs with a total capacity of 13,070.5 kW
- Conducting four training exercises on interactions in response to emergencies with the threat of power outages; in those exercises, the representatives of the following institutions participated: the authorities of the Ministry of Emergency Situations of Russia in the Krasnodar Territory and the Republic of Adygea, executive bodies of the Krasnodar Territory and the Republic of Adygea, and local self-government authorities

The Company confirms its readiness for operation during the heating season every year by receiving the Readiness Certificate. Within the framework of preparation for the heating season 2021/2022, production programmes are implemented, scheduled emergency training courses are conducted, events as per the requirements of the Federal Service for Ecological, Technological, and Nuclear Supervision (Rostekhnadzor) are held. 1 Order of the Ministry of Energy of Russia No. 1191 dated 3 November 2022 approved the results of the assessment of the readiness of power industry facilities to work in the 2021/2022 heating season.

To prevent fires and ignitions at the Company's facilities, Order No. 118-od On Preparations for the Fire Hazard and High-Temperature Period of 2021 was issued on 1 March 2021. The activities covered by the Order were carried out to the fullest extent, in particular:

235 facilities

WERE SUBJECT TO INSPECTION OF MAINTENANCE OF FIRE PROTECTION INSTALLATIONS

34 facilities

HAD THE SERVICEABILITY OF THEIR FIRE PROTECTION INSTALLATIONS RESTORED

1,528

FIRE EXTINGUISHERS WERE PURCHASED AND 1,352 WERE RECHARGED

163

FIRE DOORS WERE INSTALLED

2

INTERNAL FIRE WATER SUPPLY SYSTEMS WERE RESTORED

2,657

VIOLATIONS WERE DETECTED DURING FIRE SAFETY INSPECTIONS; 2,549 OUT OF THOSE HAVE ALREADY BEEN ELIMINATED

248

SETS OF ESCAPE HOODS WERE ACQUIRED FOR THE COMPANY'S EMPLOYEES

In 2019–2021, neither fire / ignition at the Company's facilities nor emergency outage of power equipment as a result of fire was recorded.

The Company's preparation for the flood period was carried out by the Company's Central Flood Commission (approved by Order No. 25-r On the Preparation and Tasks for the Successful Operation During the 2021 Flood Period dated 29 January 2021) as part of the Kuban Headquarters' activities and by similar commissions of the Company's branches. A total of 66 organisational and engineering measures were taken.



Organisational

- 11 meetings of the flood commissions were held, at which issues on preventing and eliminating possible technological violations and/or emergencies at the Company's power facilities during the spring-summer flood period considered.
- Monitoring of power facilities in the possible flooding areas was performed and the list of those updated. According to the monitoring results, up to 387 facilities (0.5 % of the total power facilities) fall into the possible flooding area, including 110 those of main grid (24 substations of 35–220 kV, 86 sections of poled lines of 35–110 kV) and 277 distribution grid facilities (212 sections of poled lines of 10–0.4 kV and 65 transformer substations of 10/0.4 kV).
- The series of training was conducted (from 27 April 2021 to 28 April 2021) involving the management bodies and material and human resources of the territorial links of the Krasnodar Territory and the Republic of Adygea emergency response functional subsystems to drill the actions of the Company's management bodies and material and human resources in natural and technogenic emergencies caused by the impact of hazardous weather events during the flood period.
- A total of 66 emergency training courses were conducted in the Company's power grid branches to eliminate the possible consequences of flooding the power facilities.
- The heads of the Company's executive office and the Adygean Power Grids branch took part in two meetings of the Commission for Emergency Situation and Fire Safety (CES&FS) of the Krasnodar Territory administrations and two of those of the Republic of Adygea on the operational readiness of power equipment in the Company's operational responsibility area during the 2021 flooding period. No claims or observations from executive authorities and CES&FS of administrations of the above entities of the Russian Federation were received.

Engineering

- Design solutions were implemented for installation of pole No. 53 of 110 kV Shepsie to Tuapse traction cable-type power line with a tap line to the substation terminal and 110 kV Tuapse Refinery to Tuapse traction cable-type power line with a tap line to the substation terminal (combined suspension) on a pile foundation.
- Compensation measures for power supply of socially significant objects of the city of Tuapse in case of flooding on the Tuapse River under the threat of falling poles of power transmission lines Nos. 471, 472 and 52/53, 53 were developed.
- The examination of linear and areal power grid facilities was performed.

Inspection of readiness

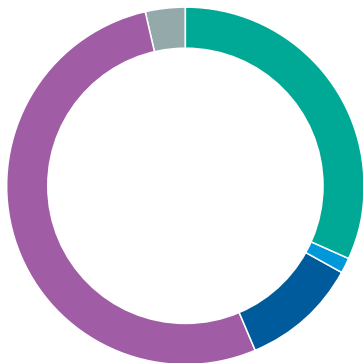
- Inspection of readiness of the Company's material and human resources to eliminate the consequences of disturbances due to the impact of flooding on power grid facilities. The Company has ensured the readiness of 392 teams, 1,791 employees, 715 units of equipment, including 22 mobile teams (126 employees) equipped with appropriate technical means (49 units, including 22 motor vehicles and 27 units of special equipment), tools, rigging, spare parts, communication aids, special clothing, catering rations, and financial assets.
- Watercraft and water pumping equipment. Available watercraft (small boats, including autoboot with Yamaha 40 motor) and 26 motor pumps are made available to be used in case of flooding.
- Reserve power supply sources (RPSS). 120 RPSSs with a total capacity of 13.11 MW, including 109 mobile RPSSs with a total capacity of 12.67 MW were made ready.

The Company's Grid Management Centre daily interacted with the regional centres for hydrometeorology and environmental monitoring of the Krasnodar Territory and the Republic of Adygea and the Sochi Hydrometeorological Centre, as well as crisis management centres of the Main Directorates of the Ministry of Emergency Situations of Russia for the Krasnodar Territory and the Republic of Adygea to obtain operative data on weather conditions and flood situation at the water bodies of the Krasnodar Territory and the Republic of Adygea.

During the flood period, 191 reports of adverse meteorological phenomena or multiple adverse meteorological phenomena were received, including information on threats of rising water levels in the rivers of the Krasnodar Territory and the Republic of Adygea; that is a 50% year-on-year increase.



MAIN CAUSES OF ACCIDENTS IN THE ROSSETI KUBAN POWER GRIDS IN 2021



- 2202** ■ Poor technical condition of equipment (insulation ageing, loss of conductor mechanical strength, change of material properties, etc.)
- 97** ■ Exposure to animals and birds
- 721** ■ Interference of the third parties not involved in production process
- 3654** ■ Exposure to repetitive natural phenomena
- 233** ■ Design, structural, manufacturing or installation faults (shortcomings)

All activities according to the requirements of the Federal Service for Ecological, Technological, and Nuclear Supervision with a deadline of 2021 were fulfilled and decontrolled.

To ensure reliable operation of the electric grid complex under the conditions of de-energising consumers and other emergencies related to de-energising consumers, the Company's headquarters operate permanently; the representatives of the headquarters regularly participate in activities aimed at ensuring the secured power supply in the Krasnodar Territory and the Republic of Adygea.

REPAIR AND MAINTENANCE

In order to ensure sustainable power supply to the industrial, agricultural and residential facilities of the Krasnodar Territory and the Republic of Adygea, the Company annually develops and implements the Maintenance and Repair Programme (M&R), which addresses the following aspects:

- The rated frequency of overhauls, midlife repairs, and routine maintenance of power equipment
- Technical condition of the facilities
- Results of preventive tests
- The need to comply with the requirements of supervisory authorities
- Elimination of technological disturbances
- Feasible and efficient operation of power grids

The deviation of the actual M&R volumes from the 2021 targets was caused by the following:

- Implementation of an additional range of measures aimed at ensuring the reliability and safety of power supply to facilities during the large-scale holiday season of 2021 in the Krasnodar Territory and the Republic of Adygea

FOR THE REPORTING YEAR, THE M&R PROGRAMME WERE SUCCESSFULLY IMPLEMENTED IN ALL AREAS. PJSC ROSSETI KUBAN PLANNED TO CARRY OUT WORK WORTH RUB 3,062.2 MN IN 2021. ACTUAL IMPLEMENTATION OF ACTIVITIES AMOUNTED TO RUB 3,278.0 MN, OR 107% OF THE PLANNED TARGET.

- Preparatory activities for the 2021/2022 heating season
- The rising cost of materials, works and services

At the same time, the Company achieved the level of the 2021 tariff balance solution for M&R by effectively reallocating the excess revenues to other areas of its business.

KEY PERFORMANCE INDICATORS OF THE REPAIR PROGRAMME

| Work description | 2019 (actual) | 2020 (actual) | 2021 (actual) | 2022 (plan) |
|---|---------------|---------------|---------------|-------------|
| Clearing the overhead line right-of-ways (ha) | 2,177.7 | 2,464.0 | 1,701.8 | 1,590.5 |
| Replacing ground wires (km) | 78.7 | 77.2 | 72.1 | 31.8 |
| Replacing insulators (pcs) | 95,082 | 95,733 | 77,100 | 58,423 |
| Repair of power transformers (pcs) | 34 | 16 | 11 | 7 |
| Repair of circuit breakers | 940 | 895 | 958 | 1,122 |
| Repair of isolating switches, shorting plugs, disconnectors | 1,749 | 1,923 | 1,855 | 1,867 |
| Repair of transformer substations | 3,026 | 2,059 | 1,909 | 1,510 |
| Repair of PTL (km) | 14,024.0 | 13,259.3 | 10,627.8 | 7,702.5 |



In addition, to improve reliability of the power grid complex operation, the following works were carried out in 2021 in accordance with the Comprehensive Programme for Improving the Reliability of Operation of Substation Equipment and PTLs of the main grid and 0.4–10 kV distribution grid:

438

CAPACITORS (STATIC CAPACITOR BATTERIES) WERE REPLACED

18

SUBSTATIONS OF 35–110 KV RATING HAVE THEIR MECHANICAL AND ELECTROMAGNETIC INTERLOCKS RESTORED

340

PHYSICALLY WORN OUT BUSHINGS OF 35–110 KV OIL CIRCUIT BREAKERS AND POWER TRANSFORMERS WERE REPLACED

539

OVERHEAD LINES AND OVERHEAD CABLE LINES OF 35 KV RATING AND OVER (WITH THE TARGET OF 507)

1,124

SUBSTATIONS OF 35–110 KV RATING (WITH THE TARGET OF 373)

6,825

TRANSFORMERS AND OVERHEAD LINES OF 0.4–10 KV RATING (WITH THE TARGET OF 4,866) UNDERWENT THERMAL IMAGING INSPECTIONS

380

STATIONARY VALVE-TYPE LIGHTNING ARRESTERS OF 35–110 KV RATING THAT SERVED FOR OVER 25 YEARS WITH OVERVOLTAGE LIMITERS OF CORRESPONDING VOLTAGE CLASS WERE REPLACED

894

POLES OF 10 KV OVERHEAD LINES AND 5,599 POLES OF 0.4 KV OVERHEAD LINES WERE REPLACED

961.37

KM OF WIRES OF 0.4–10 KV OVERHEAD LINES WERE REPLACED

625

TRANSFORMERS OF I–II SIZES WERE REPAIRED

The limits for maintenance and repair costs for 2022 are established at the level of RUB 3,284.21 mn, which is 0.2% above the actual costs in 2021 (RUB 3,278.0 mn). The activities planned for implementation under the M&R Programme for 2022 are sufficient to maintain technical conditions of equipment and PTLs at the “good” level and will allow providing the consumers of Rosseti Kuban with reliable power supply.