



АКЦИОНЕРНОЕ ОБЩЕСТВО
«СИСТЕМНЫЙ ОПЕРАТОР
ЕДИНОЙ ЭНЕРГЕТИЧЕСКОЙ СИСТЕМЫ»

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Kaliningrad Power System successfully undergone full-scale tests to ensure reliable isolated operation

Tests carried out by SO UPS and supervised by the Ministry of Energy of the Russian Federation on September 25th, 2021, confirmed that the Kaliningrad Power System is ready for isolated operation.

The experts of the national system operator's Interregional Dispatch Office of North-West (North-West IDO) and Regional Dispatch Office of Kaliningrad (Baltic RDO) in order to carry out the tests supervised the interaction of all the industry entities and regional authorities involved and held responsibility for the required operational security measures.

By the decision of the Kaliningrad Regional Headquarters for power supply safety, the supply reserves were ordered fully operational and the community awareness was provided by schedule.

From 9:07 am to 5:10 pm local time, 110 kV and 330 kV transit lines with Lithuania were disconnected. During this period the Kaliningrad Power System operated independently.

During the tests one unit at half of nameplate capacity of the Kaliningradskaya TPP-2, three units of the Pregolskaya TPP, two units of the Mayakovskaya TPP, two units of the Talakhovskaya TPP and one unit of the Primorskaya TPP were put into operation. The set-up total spinning reserve was 370 MW, which was enough to compensate one of the largest unit shutdown and possible demand deviations.

The demand in the Kaliningrad Power System varied from 524 MW to 564 MW, and the peak was registered at 11:34 am. The maximum deviation from forecast demand did not exceed 20 MW.

Frequency regulation for the isolated system was provided by the Mayakovskaya TPP (4 hours), the Pregolskaya TPP (1 hour), and the Talakhovskaya TPP (3 hours) in sequence. Automatic settings performed well, and regulation was at 50 ± 0.1 Hz band with the average of 50 Hz. Voltage level at the control points and on the 330 kV buses of the network facilities was acceptable.

For the first time, the Baltic RDO used P&A algorithm to calculate per 30 sec the required load shedding and to transfer data to the Pregolskaya TPP stability control scheme through M2M channel. The P&A complex scoped load shading capacity to compensate possible emergency shutdown – from 125 to 145 MW in case of loss of the half-unit (at 160 MW) of the Kaliningradskaya TPP-2 and from 35 to 50 MW in case of loss of the most loaded unit (at 75 MW) of the Pregolskaya TPP.

The Baltic RDO Control Center monitored selected control actions in real time, ready to activate tertiary reserves in case of emergency shutdown of any generator and to re-connect consumers, if disconnected by P&A, within 20 minutes.

The tests for isolated operation of the Kaliningrad Power System are necessary due to the EU plan to synchronize the Baltic States with the Continental Europe. Similar tests took place for 72 hours in 2019, for 8 hours in 2020, and will continue till 2025, before the Baltic States separate from the Unified Power System of Russia. At present the Baltic States operate synchronously with Russia and Belarus.

ENDS.

Key features of the Kaliningrad Power System

Winter peak consumption – up to 800 MW, summer peak consumption – up to 550 MW.

Total installed capacity – 1 918 MW, incl:

- Kaliningradskaya CHPP-2 (900 MW);

- Pregolskaya TPP (463 MW);
- Primorskaya TPP (195 MW);
- Talakhovskaya TPP 161 MW);
- Mayakovskaya TPP (160 MW);
- power plants in the retail market (wind, small hydro, thermal) of total 39 MW.

Automatic frequency regulation for isolated operation: station systems of the Mayakovskaya TPP, the Talakhovskaya TPP, and the Pregolskaya TPP with two operational modes:

- capacity regulation with frequency correction;
- automatic flat frequency regulation (for isolated operation).

The deadband of primary regulation for the first mode is 50 ± 0.075 Hz, and for the second – 50 ± 0.02 Hz.

The control station (Mayakovskaya TPP or Talakhovskaya TPP) is assigned to provide flat frequency regulation using two units in the middle of range limit of about 80 MW and ensures automatic ramp up to 160 MW or down to 4 MW in case of (consumption or generation) imbalance. The Pregolskaya TPP is also able to provide flat frequency regulation with range of about 70 MW. All other units use capacity regulation with frequency correction.

When secondary reserve decreases below regulatory level at the control station, the rest provide tertiary reserves. Implementation of aFRR system with automatic commands for ramp up / ramp down is under development.

The Pregolskaya TPP is equipped with stability control scheme capable to:

- operate synchronously with the Russian power system and provide delivery through controlled cross-section "Lithuania – Kaliningrad";
- ensure isolated operation of the Kaliningrad Power System and provide active power imbalance replacement in case of emergency shutdown.

For isolated operation the stability control scheme offers two modes:

- predetermined algorithm (local mode);
- centralized emergency control system PAC of the Baltic RDO.

Centralized emergency control system algorithm with sufficient amount of control actions after emergency disconnection allows to provide:

- post-emergency dynamic frequency deviation not lower than 49.2 Hz;
- post-emergency stable frequency deviation not lower than 49.6 Hz.

Control action adjustment (for load shedding) adapts to actual consumption and generation, and two independent channels of cross-machine exchange provide adjustment charts' transfer from the upper level of the centralized emergency control system to the stability control scheme of the Pregolskaya TPP.

When the upper level of the centralized emergency control system is turned off, the Pregolskaya TPP stability control scheme (local mode) will automatically start limiting dynamic frequency deviation for transient state. In case of insufficient emergency control provided by the stability control scheme the remaining emergency imbalance is compensated by under-frequency load shedding.