CONTROL ISSUES OF SWITCHES FOR OPERATIONAL ENERGY OUTPUT AND PROTECTIVE SWITCHING IN POWER SUPPLY SYSTEMS OF ITER SUPERCONDUCTING COILS [[1]](#footnote-1)\*)

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Over a long period of physical research on tokamaks, their power supply systems have evolved from the simplest devices based on capacitor banks to unique electrical complexes. In the largest operating facilities, the pulse power of power sources reaches *2.5 GW*, and the energy stored in the magnetic field exceeds the value of *3 GJ*. Even more impressive values describe the power supply system of the ITER tokamak: the total stored electromagnetic energy in its windings exceeds *50 GJ*, and the pulse power reached during the fast discharge of energy from the superconducting coils reaches *9 GW* [1].

The creation of control devices for the components that make up the power system of an electrophysical installation of such scale involves the need to solve complex technical problems, the most significant of which are:

* creation of a distributed control and data acquisition system with a large amount of processed and transmitted information;
* data acquisition on the status of high-voltage and high-current passive and active power system equipment;
* solving the issues of ensuring synchronous operation of single-type control objects and various subsystems at very fast speeds of physical processes;
* integration and interaction with central control systems;
* ensuring the reliability and failure-free operation of the control system;
* error handling and implementation of the equipment protection strategy.

This paper will consider in detail the issues and aspects that were solved during the development and creation of the switching control system for switching networks and protection in the power supply systems of ITER superconducting coils.

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References

1. Osnovy proyektirovaniya magnitnykh termoyadernykh reaktorov / A.B. Alekseev [i dr.]; pod red. V.A. Glukhikh, G.L. Saksagansky, SPb.: izd St.Petersburg Polytechnic University, 2016, 613 p.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/E/ru/JY-Gubanova.docx) [↑](#footnote-ref-1)