

Monitoring and decision support systems – ways to improve power system electrical mode control effectiveness

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Real time power system monitoring and operation control is an essential condition to provide effective and qualitative control of electrical modes. Operative-information complex (OIC) comprising systems of accumulating, processing, storing, archiving, displaying of the operative information getting from the power system facilities is one of the most important tools used in control centers to monitor electrical mode of the Unified Power System of Russia (UPS of Russia). For the dispatchers to use information they got effectively and well-timed a number of systems to control and monitor power system technological processes, dedicated tasks and forms of operative information display are implemented in OIC.

Control and monitoring systems are intended to execute control of electrical mode parameters, power utilities' equipment state as well as to timely inform the staff about controlled parameters admissible values range breaking or change of the power utilities' equipment state.

To control electrical modes of the UPS of Russia operation the following monitoring systems are used:

- monitoring of the voltage levels (MVL);
- current load monitoring system (CLMS);
- power flows and congestion control in the cross-sections (PFCC).

MVL system is designed to improve the effectiveness of electrical mode control by means of all admissible (set) voltage levels control including voltage curve at the control points. In case of failure the dispatching staff takes measures to control the voltage. For information support of the dispatcher actions:

- OIC includes visualization of the meters estimating actual voltage deviations from all boundary admissible values and determination of the available reserve of the reactive power control at the generating equipment
- Provision for power system operational modes control contains information on estimated effectiveness of the measures of voltage control

Integration of the decision support system functioning on the base of PAC "Three-level automated system for generating of physical and equivalent models to calculate and estimate electrical modes" (PAC TAS) using information model of power system of the unified CIM format into MVL will help to improve effectiveness of MVL.

CLMS system is designed to control current load of the transmission lines and electric grid equipment. The equipment load control is carried out with account for admissible duration of overload and dependence of admissible current load on the actual outside air temperature, what facilitates the implementation of optimal control in the event of or threat of unacceptable overload occurrence.

CDCCS system controls correspondence of active power flows in the controlled cross-sections to maximum admissible active power flows in the actual network scheme.

Within the frames of control process organized and performed continuously for each cross-section the following actions are performed:

- determination of the current active power flow
- automatic (on the basis of the information system data) determination of the maximum admissible active power flow depending on factual value of the influencing factors.
- determination of the active power reserve at the power stations participating in the active power flows control
- gathering statistics and parameters of disturbances, etc

The report presents the main tasks and functions, ways of implementation and perspectives (for the projects under realization and planned ones) for the above mentioned as well as other systems of monitoring and decision support. Special attention is paid to the experience of practical use of the monitoring systems in operation control of the power system electrical mode including emergency cases as well as to possible integration of the monitoring systems with information model PAK TAS what can help to solve existing problems and overcome resources limitations.