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# Creation of a geographic information system of thunderstorm activity based on the existing complex of 6-110 kV distribution networks using the devices for identifying faults in overhead lines

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The report reviews creation of the geographic information system of thunderstorm activity based on the existing complex of 6-110 kV distribution networks using modern fault indicators for overhead lines. Due to current and voltage disturbance power lines are good antennas transmitting lightning impulses along the line. Power lines are a convenient base for creating a knowledge and information system of thunderstorm activity. Application of modern fault indicators, performing highly accurate oscillographic testing of processes in overhead lines, allows to receive a full picture of currents, voltages, impulse frequency and duration, wave forms and amplitude in overhead power lines. Knowledge of these values in combination with a real time tag, which is also registered by a fault indicator, allows to perform complex data analysis in the geographic information system. In order to measure the parameters of thunderstorm activity more accurately a setting for expected parameters of induced charge is required: current and voltage jumps range, wave form and amplitude, rate of voltage overload occurrence.

Analysis of information from several in-line instruments in real time gives an opportunity for evaluating thundery front movements, rate of lightning impulses occurrence, current and voltage jumps range. In order to expand informational possibilities and first of all to accurately determine GPS-coordinates of a lightning discharge and features of its behavior, an additional algorithmic data processing is needed. The report reviews a mathematical model for correct binding of a lightning impulse to a geographical point. Knowing specific parameters of active resistance and conductivity, inductance and capacity for each overhead power line, having received information about currents and voltages of a lightning impulse in the place of fault indicators installation and using created mathematical model it is possible to calculate a point on an overhead line, that is as near as possible to the place of the lightning stroke and to calculate the parameters of the lightning impulse. Increase in the amount of measuring and transmitting devices, primarily of fault indicators, may result in improvement of algorithmic data processing and accuracy of determining lightning charge size and coordinates. Representation of data on the Intensity of current thunderstorm activity in the geographic information system will allow to warn control services about starting and ending of a thunderstorm along the power line in advance.

The solution for on-line monitoring of thunderstorm activity map and of thunderstorm influence on processes in power lines is featured not only by minor

expenses but also by minimum additional measuring equipment for overhead power lines. Installation of server for geographic information monitoring system additionally to existing modern fault indicators and application of modern Big data methods will allow to:

- partially prevent accidents on electricity generation facilities and failures in power supply to consumers due to on time protection measures of quick response;
- immediately eliminate faults in power lines due to the knowledge of accurate GPS-coordinates of the damaged section;
- improve power lines system designing on the basis of highly accurate thunderstorm activity statistical data for a long period of time;
- improve human safety during thunderstorms and human-caused accidents;
- reduce economical damages from thunderstorm.