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ТА СОЦІАЛЬНИХ КОМУНІКАЦІЙ**



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**МАТЕРІАЛИ VII ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ
СТУДЕНТІВ, АСПІРАНТІВ, ВИКЛАДАЧІВ ТА СПІВРОБІТНИКІВ**

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TRANSIENT OVERVOLTAGE AND ITS EFFECT ON A SUBSTATION

We seem to have problems with power industry nowadays. It often faces unforeseen overvoltages in the system. But what does overvoltage mean?

Overvoltage is associated with the electric field strength, namely with its increase. Overvoltage happens when the electric field strength reaches a value that is dangerous for the insulation state. What consequences might overvoltage cause?

Factories are losing tens of millions per year due to power interruptions. Moreover, the cost of replacing equipments damaged because of voltage spikes is very high. Power industry experiences huge losses of production. The effect of transient overvoltage on substation equipment and the conforming protection against it are likely to be the most important elements of this problem.

Reliability of power systems depends on their protection against abruptly overvoltages in substations. Stations include strategic and incredibly costly power equipment. Surge protection is indispensable to minimize system disturbances and equipment failures. Failures in industrial and domestic equipments occur due to transient overvoltage in our power system. In large part the equipments using in the substation have a specific Basic Insulation Level (BIL). Consequently, if the overvoltage exceeds the defined restriction, insulation breaks down and failure of equipments occurs. [2,p.1005].

What can cause these overvoltages? Transient overvoltages in power systems may be caused due to several reasons:

- Due to lightning strikes;
- Due to switching operations of inductive or capacitive loads.

Lightning never falls straightway over the substations because they are protected in such a way. Movable waves appearing due to lightning at a remote point far from the substation, travels into the substation through the towers and entrancing transmission lines. Transient spate voltages can cause operational problems of the equipment and production failure for the industrial systems and substations. Moreover, protection of power systems from transient surge damages is decisive for maintaining good power quality and controlling toll caused to the utility system.

A lightning strike is very ruinous on electrical installation and creates an immense surge or transient. A transient is a transition from one state to another. If the voltages and currents in a circuit do not change with time, it is called a steady state. In other words as long as the voltages and currents are steady AC sinusoidal quantities, we can call that a steady state as well.

But when the state of a circuit changes, say from "off" to "on", the state of the circuit does not change immediately. The circuit state will go through some transition from the initial state, "off" to the final state, "on" and that change will take some amount of time.

Generally, transients are fleeting changes in voltage or current that occurs over a short period of time. The fraction of most circuits operating time in transient condition is inconsiderable compared to the time in the steady state.

However, these transient periods are exceedingly important, for it is at such times that the circuits are subjected to the maximal stresses from redundant current and voltage. In extreme cases damages result. For example, this may disconnect a machine, shut down a plant or black out a city depending upon the circuit. [1,p.1].

For this reason, it is needful to have a clear understanding of the events originating during the transient periods. Technically, the main reasons of transient overvoltage can be classified into natural and other causes. The natural causes can be definitely described as lightning strikes. The other causes are switching operation in the power system.

Electrical installations that are located up to several miles away from the veritable point of the strike are subject to fatal effect a lightning strike. What is

happening during a storm? The overhead lines can transmit the effect of a lightning stroke to electrical equipment established inside substation. A lightning protection device established on a substation to protect against of a straightway strike, go up the risk of damage to electrical equipment connected to the main supply in the substation. The lightning protection device diverts the high strike current to earth, growing the potential of the ground close to the substation on which it is established. This makes overvoltage on the electrical equipment directly.

Overvoltage affects the different equipments in the substation. This is because switching of transformers, motors or inductances in general, sudden variation of load, breaking of circuit breakers lead to overvoltage.

Lightning overvoltage can be caused due to two possible ways of lightning: direct/indirect lightning. The transient overvoltage due to direct lightning can be subdivided into two forms [3,p.2-7]:

- It is important to understand that when lightning strikes a lightning conductor of the substation which is earthed, the lightning current is dispelled into the ground. Large difference of potential, namely the overvoltage, is produced by the impedance of the ground and the current flowing through it. Then throughout the substation through the cables overvoltage distributes and damages equipment along the way.

- Lightning will conduct high currents which will penetrate into the substation creating large overvoltage unless lightning strikes an overhead high voltage line. The affection caused by this type of overvoltage is usually fatal and results in explosions. For example: fire in the electrical switchboard causing exterminate of industrial equipments.

If we speak about indirect lightning, the overvoltage is found when lightning strikes in the proximity of a substation, due to the growing in potential of the ground at the point of impact.

The electromagnetic fields created by the lightning current generate inductive and capacitive coupling, leading to overvoltage. The electromagnetic field made by lightning in clouds can also produce unanticipated increases in voltage within a radius up to several kilometers.

Although less spectacular than in the previous case, irreparable damage is also caused to so called sensitive equipment such as computer power supplies and safety and communication systems. Summing it up it is necessary to say that overvoltages should be carefully considered when designing substation as they represent a danger to people and electrical equipment.

References:

1. Allan Greenwood ,‘Electrical Transients in Power Systems’, Second Edition, 1991.
2. Manish Paul, Barnali Talukdar, Banani Baiysha, ‘Simulation of Overvoltage and Undervoltage in PSIM’.
3. RFM, Lightning and surge protection ,White Paper application note.

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FINANCING OF EDUCATION IN THE UNITED TERRITORIAL COMMUNITIES

At present the relevance of the topic of financing education in the united territorial communities is defined by the fact that the development of education in territorial communities in Ukraine takes place under qualitatively new conditions. This process is characterized by a high degree of intensity, which is due to the reform of decentralization and the association of territorial communities, in particular.

The purpose of the research is to determine the state and characteristics of the financial provision of education in the united territorial communities in modern Ukraine.

Nowadays one of the primary tasks of reforming the system of public finances and administrative-territorial organization of Ukraine is the formation of effective mechanisms of financial support for the functioning of territorial communities for their