

## **VOLTAGE FLUCTUATION DIAGNOSTIC FOCUSED ON IDENTIFICATION AND LOCALIZATION DISTURBING LOADS IN POWER GRIDS**

One of the most common disturbing phenomena in the power grid is voltage fluctuation. This phenomenon can cause incorrect operation of other power loads that are supplied from the same power grid as disturbance source. If these power loads are light sources, then there can be a phenomenon of noxious flicker inducing epileptic and depressive states, which are a direct threat to life of a sick person. The carried out own research shows that the effects of voltage fluctuation (e.g. obnoxious flicker) are noticeable by every fifth person. In addition, the problem of voltage fluctuation in 74% concerns people living in cities where the population does not exceed 20.000. So, usually this problem is downplayed by people from large cities. The applicant himself comes from a small town and has often experienced the effects of voltage fluctuation, which is, inter alia, one of the reasons why his research focuses on studying the voltage fluctuation sources.

It is also worth noting that every fifth person has high sensitivity to the reception of external stimuli (e.g. obnoxious flicker resulting from voltage fluctuation) by the nervous system. This fact was investigated by Elaine Aron in 2014. The occurrence of hypersensitivity in healthy people is associated with the ADRA2b gene, which was presented in studies of Rebecca Todd in 2014. This gene is present in 50% of the population, however, but in many cases remains dormant. In people with high sensitivity, the obnoxious flicker occurring due to voltage fluctuation, results in a migraine aura with symptoms such as headache, nausea, or photophobia. Hence, the effects of voltage fluctuation are a serious factor that not only can result to a reduction in operating time of devices supplied from the power grid or irreversible damage to devices supplied from the power grid, but also is a real factor reducing the quality of human life. Therefore, it is important to strive to reduce the phenomenon of voltage fluctuation.

In practice, the problem of voltage fluctuation is solved only when a complaint is made by a power consumer. In this case, there is a need to identify and to localize disturbing loads in the power grid to eliminate disturbance they emit. The obtained research results allow the development of comprehensive diagnostics of voltage fluctuation sources in the power grid that will consider all disturbing loads. This method would improve the process of localization voltage fluctuation sources, both in the event of a complaint by a power consumer to power operator, as well as and when disturbance occurs.

The aim of the project is first research on the use of empirical decomposition methods to selectively identify and locate voltage fluctuation sources in the power grid. The aim of the project is second to research methods that recreate voltage variation in the power grid to allow the implementation of comprehensive diagnostic method in the existing measurement and recording infrastructure with limited computational capabilities. The comprehensive diagnostics of disturbing loads is possible with the use of multi-point methods using selected parameters of disturbing loads, such as the amplitude (parameter dependent on supply circuit and disturbance sources) and the rate of voltage fluctuation (parameter dependent only on disturbing loads). The indicated parameters can be determined on the basis of signals associated with specific disturbance sources, obtained from the empirical decomposition process.