PS1 "Software platforms for control of distributed energy resources"

Microgrid monitoring protection and control based on synchronized measurements

Assoc.Prof. Srdjan Skok
Faculty of Engineering,
Croatia

MSc. Igor Ivankovic, Ivan Sturlic,
Croatian Transmission Operator
Croatia

Kresimir Ugarkovic
Croatian Distribution Operator
Croatia

srdjan.skok@riteh.hr

Smart microgrids are small modern centralized power systems which contain all constituents as large power systems (production – usually Renewable energy sources (RES); power storage systems; transfer – from the source to the consumer; consumers). The basic characteristic is that the microgrid may be controlled just like a large power system and it can be in the island operation or connected to a large power system. Smart microgrids are constituent parts – blocks of an smart power grid. Specifically, locally limited smart microgrids are controlled from the level of the entire power system. Smart microgrids have precisely determined limits, they are uniquely controllable entities and may operate both in connection to the power system and in island operation. In an increasing number of cases, by connecting the RES on the distribution network, RES group in a certain area (e.g. within one supply area), and the accumulation of their power results in the need to create certain conditions in the distribution grid, in order to take over the total produced electric power from distributed sources. The increased production power in relation to the existing load in a certain area as a rule reflects through deteriorated voltage conditions in the grid (increased voltage). In that case, Distribution Area Operator has to intervene in the existing infrastructure. In order to reduce the investments into the infrastructural operations, real time monitoring, protection and control of microgrids, just as the surrounding smart power grid, should be upgraded, in order to retain the stability of the entire power system. The use of Synchronized measurements and Phasor Measurement Units (PMU) suggests itself as the best solution. Real time monitoring, protection and control of microgrid based on synchronized measurement technology requires hardware and the appertaining software support. This paper

presents solution for protection and control of microgrids, with working title LAMPAC (Local Area Monitoring, Protection and Control), focused on developed software support. LAMPAC software platform is developed according to which PMU and the central controller would be used in the microgrid. PMU devices with measured value of voltage and current phasors in 20 ms of resolution are transferred to the central controller, which by applying certain algorithms may provide an image of the microgrid condition in real time, but can also make decisions about separating the microgrid into island operation, resynchronizing and recognizing the conditions for island operation. The central controller is connected to the monitoring and control of RES in order to coordinate certain activities and maintain the stability of the microgrid. The combined installation of PMU devices on precisely determined junctions in more microgrids, which is the targeted condition of distribution network control, requires a series of analysis which are developed and imported in LAMPAC software platform (load flow and short-circuit calculation for various operational states, as well as dynamic response of distributed sources). As a conclution to this synopsis, the main subject of the paper is presentation of software support for monitoring, protection and control of microgrids with associated algorithms.