

In the near future, a large number of DERs are expected to be connected to the distribution network. In order to analyse the possibility of including PMU devices in the monitoring of the distribution network, primarily on medium voltage level, DSOs in Croatia, Slovenia and Greece were surveyed. Two problems are common to all surveyed DSOs: poor communication connectivity and lack of voltage and current sensors in the network. For the purposes of monitoring the DERs themselves, and not monitoring along the depth of the network, the lack of measuring transducers is not so pronounced. Therefore, this contribution addresses the problem of insufficient communication connectivity.

Application of WAMS technology can be divided into two application groups. The first includes so called mission critical applications that take place in real time, in which the reaction time is on the order of 100 to 200 ms and which require reliable communication channels. The second group are so called mission supporting applications, which can be delayed for a few seconds in monitoring tasks or can work completely in off-line mode. Since the PMU packets are time-stamped, the data delay does not degrade the quality of the resulting conclusions.

In order to achieve the optimum use of PMU technology for DER facilities, STER realized two pilot demonstrations in Croatia and Bosnia and Herzegovina with innovative hybrid concept of the WAMS system. Hybrid WAMS consists of two parts. The first is the local, protective or WAMPAC part, in which two PMU devices send data to the local PDC application via a reliable network and IEEE C37.118 protocol. The main task of the WAMPAC part is the detection of island operation. The PDC application is implemented as a software extension on one PMU. In both demos, PMU devices are connected to LAN in substations owned by DSO. Substations are linked via WAN i.e., SDH connection provided by TSO.

The second part of the system is the global, monitoring WAMS that uses the mobile network to transmit data to the central PDC application.

In order to avoid data loss and mitigate problems that may arise in unreliable mobile telephony, the standard C37.118 protocol was enveloped by a proprietary layer that enables two-way data exchange between the PMU device and the PDC server. The main purpose that extension is retrieving data from local PMU memory storage on demand.

There are several advantages of this approach. First, reliable communication needs to be extended only in very limited area i.e., between relatively close nodes in the distribution network, thus reducing the necessary investments in communication infrastructure. Second, if the mobile network is used to collect PMU data, it is very easy to create a single system that crosses the borders of individual entities. And thirdly, the PDC service in the cloud simplifies the integration of multiple systems, i.e. expanding the insight into the state of the system on several levels.