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Digital Twin of Real Electrical Distribution System with Real Time Recursive Load Flow Calculation and State Estimation

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Abstract : Digital Twin (DT) is a technology that generates a virtual representation of a physical system or process, enabling real-time monitoring, analysis, and simulation. DT of an Electrical Distribution System (EDS) can perform online analysis by integrating the static and real-time data in order to show the current grid status and predictions about the future status to the Distribution System Operator (DSO), producers and consumers. DT technology for EDS also offers the opportunity to DSO to test hypothetical scenarios. This paper discusses the development of a DT of an EDS by Smart Grid Controller (SGC) application, which is developed using open-source libraries and languages. The developed application can be integrated with Supervisory Control and Data Acquisition System (SCADA) of any EDS for creating the DT. The paper shows the performance of developed tools inside the application, tested on real EDS for grid observability, Smart Recursive Load Flow (SRLF) calculation and state estimation of loads in MV feeders.

Keywords : digital twin, distributed energy resources, remote terminal units, supervisory control and data acquisition system, smart recursive load flow
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