Multi-resolution/High-resolution Telemetry Data Sensors for Interharmonic and Oscillation Detection within a Smart Grid Implementation

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Abstract:
Within the electric power ecosystem, monitoring and measuring technologies have greatly evolved. Yet, many "smart grid" devices still struggle with fundamental capabilities, such as sufficient resolution. Telemetry data of insufficient resolution will result in key patterns not being able to be discerned. Accordingly, multi-resolution and higher resolution (more granular) telemetry data from power systems are needed to facilitate more opportunities for utilizing a wider range of data analysis methods for detecting and analyzing complex events. For example, the presence of power system interharmonics has not only introduced new classes of problems, but also vibrations and oscillations, which can cause damage to conductors, insulators, armatures, and powerline pylons and result in the collapse of an entire power transmission system. Oscillations are one of the major issues within a power system (natural oscillations, particularly electromechanical, and transient oscillations as well as forced oscillations have been particularly troublesome). Indeed, synchronous machine generator in any kind of power plant are candidates for introducing the harmonics that feed into the power system and cause power oscillations. Several issues pertaining to the power oscillation detection problem have been recognized including the challenge to perform online tracking of power oscillation modes, the speed of analysis, and noise detection and filtering fidelity during the power oscillation event. Moreover, in order to detect some specific types of oscillations, it is necessary to measure interharmonic phasors along with the prototypical synchrophasors. However, many phasor measurement units (PMUs) in the market are not capable of measuring the interharmonic phasors. This paper delineates the need for advanced multi-resolution/high-resolution telemetry data sensors for interharmonic and oscillation detection (i.e. Subsynchronous oscillation detection units) within a Smart Grid implementati...

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