An Algorithm for Accurate Detection and Correction of Technical and Non-Technical Losses Using Smart Metering

Date:	Tuesday, February 23, 2021
Time:	01: 10 PM – 02: 00 PM
Location:	https://kfupm.zoom.us/j/98305089222?pwd=enFydGhqaW8wc1VwL1JPdlUxNCtrUT09
Meeting ID:	983 0508 9222
Passcode:	747756

Speaker:

Mr. Abdullah Shah
Lecturer
EE Dept., KFUPM

Abstract:

Power losses in electric distribution systems are categorized into technical and non-technical losses. Technical losses (TL) refer to the heat losses in the distribution system components. Non-technical losses (NTL), however, refer to losses that come in different shapes and forms, such as tampering with smart meters, attacking the data transmitted from smart meters, malfunctioning of smart meters, and tapping service cables. One of the long-lasting challenges of metering systems in power grids has been the non-technical losses (NTL); such as tampering with the metering units and tapping service cables. Northeast Group, LLC estimates the global annual financial losses, due to NTL, to reach $96 billion. Recently, advanced metering infrastructure (AMI) has become an essential component in all smart grids. AMI adds software and communication layers to the metering system. Although these layers open venues for new types of NTL; such as cyber-attacks, they can be useful in detecting these NTL. To accurately detect and correct NTL, it is essential to first estimate the TL. Estimating TL requires knowledge of the network topology and cable impedances, which might not be readily available for the concerned utility company. This work proposes an algorithm with the following functions: remotely characterizing and updating the cable impedances, detecting and classifying the type of losses, estimating the TL and NTL when a smart meter is in error, estimating these losses due to tapping a power cable by a registered or an unregistered user, and estimating these losses due to a cyber-attack. Both active and reactive powers are considered. The proposed algorithm deploys a modified version of the Hamming code, which is originally used in detection and correction of errors in binary data transmission. Simulation results verify the accuracy and effectiveness of the proposed algorithm.

Bio:

Mr. Abdullah L. Shah received B.Sc. and M.Sc. degrees in electrical engineering from King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia, in 2016 and 2018 respectively. In 2019, he joined the Electrical Engineering Department at KFUPM as a lecturer. His research interests include advance metering infrastructure, smart meters, power system operation, integration of renewable energy resources, and smart grids.