In electric power distribution systems, the major determinant in electricity supply strategy is the quantity of demand. Customers need to be accurately represented using updated nodal load information as a requirement for efficient control and operation of the distribution network. In Distribution Load Estimation (DLE), two categories of data are utilized: historical data and real-time measured data. In this thesis, a comprehensive survey on the state-of-the-art methods for estimating loads in distribution networks is presented. Then, a novel method for representing historical data in the form of Representative Load Curves (RLCs) for use in real-time DLE is also described. Adaptive Neuro Fuzzy Inference Systems (ANFIS) is used in this regard to determine RLCs.

An RLC is a curve that represents the behavior of the load during a specified time span; typically daily, weekly or monthly based on historical data. Although RLCs provide insight about the variation of load, it is not accurate enough for estimating real-time load. This therefore, should be used along with real-time measurements to estimate the load more accurately. It is notable that more accurate RLCs lead to better real-time load estimation in distribution networks.

This thesis addresses the need to obtain accurate RLCs to assist in the decision-making process pertaining to Radial Distribution Networks (RDNs). This thesis proposes a method based on Adaptive Neuro Fuzzy Inference Systems (ANFIS) architecture to estimate the RLCs for Distribution Networks. The performance of the method is demonstrated and simulated, on a test 11kV Radial Distribution Network using the MATLAB software. The Mean Absolute Percent Error (MAPE) criterion is used to justify the accuracy of the RLCs.

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The public is welcome to attend.