

GIS-Based Identification of Overloaded Distribution Transformers and Calculation of Technical Electric Power Losses

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Abstract : Pakistan has been for many years facing extreme challenges in energy deficit due to the shortage of power generation compared to increasing demand. A part of this energy deficit is also contributed by the power lost in transmission and distribution network. Unfortunately, distribution companies are not equipped with modern technologies and methods to identify and eliminate these losses. According to estimate, total energy lost in early 2000 was between 20 to 26 percent. To address this issue the present research study was designed with the objectives of developing a standalone GIS application for distribution companies having the capability of loss calculation as well as identification of overloaded transformers. For this purpose, Hilal Road feeder in Faisalabad Electric Supply Company (FESCO) was selected as study area. An extensive GPS survey was conducted to identify each consumer, linking it to the secondary pole of the transformer, geo-referencing equipment and documenting conductor sizes. To identify overloaded transformer, accumulative kWh reading of consumer on transformer was compared with threshold kWh. Technical losses of 11kV and 220V lines were calculated using the data from substation and resistance of the network calculated from the geo-database. To automate the process a standalone GIS application was developed using ArcObjects with engineering analysis capabilities. The application uses GIS database developed for 11kV and 220V lines to display and query spatial data and present results in the form of graphs. The result shows that about 14% of the technical loss on both high tension (HT) and low tension (LT) network while about 4 out of 15 general duty transformers were found overloaded. The study shows that GIS can be a very effective tool for distribution companies in management and planning of their distribution network.

Keywords : geographical information system, GIS, power distribution, distribution transformers, technical losses, GPS, SDSS, spatial decision support system

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