

HIGH IMPEDANCE FAULT IDENTIFICATION AND LOCALIZATION IN MV DISTRIBUTION FEEDERS

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Degree of Master of Science in Electrical Engineering

Department of Electrical Engineering

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DECLARATION OF THE CANDIDATE & SUPERVISOR

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Prof J. R. Lucas

Signature of the supervisor:

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Dr P. S. N. De Silva

Abstract

High Impedance Faults (HIF) in distribution feeders are kind of an abnormal condition that most of the electric distribution utilities face if they are maintaining a bare overhead distribution network. These faults cause not only poor quality of supply to the consumers but an immense threat to their lives, if not well managed. By nature, identification and localization of these faults are very hard due to the limited current it draws from the source. But the severe potential threat remains same as it takes distribution medium voltage in to human reach unnoticed.

This study focuses on developing a methodology that can be simply implemented by the utilities to identify and localize the HIF. As a summary, starting from data acquisition, this study identifies a methodology to detect and localize the HIF and finally provides an insight on how to implement the proposed methodology.

Data acquisition is one of the main difficulties faced by the distribution utilities to monitor and identify the network conditions and take necessary precautions over the anomalies before or after the particular incidents. This is mainly due to the high cost incurred for each measuring device installed in the field with the required insulation levels up to the operating voltage classes. This study has proposed a unique time stamp based data acquisition device (based on the concept of Phasor Measurement Units) mounted on top of the conductors to collect the required data and wirelessly transmit over to a terminal unit mounted on the pole. The transmitted data is then processed in this pole mounted concentrator and notifies a central server about the identified network anomaly.

Extensive simulation analysis carried out by this study using MATALAB SIMULINK shows that the proposed methodology provides an accurate way to identify and localize the HIF under various network operational conditions.

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List of Abbreviations

Abbreviation	Description
HIF	High Impedance Faults
KPI	Key Performance Indicators
SAIFI	System Average Interruption Frequency Index
SAIDI	System Average Interruption Duration Index
AI	Artificial Intelligence
PPS	Pulse per Second
DFT	Discrete Fourier Transformation
FFT	Fast Fourier Transformation
PUCSL	Public Utilities Commission of Sri Lanka
kWh	Kilo Watt Hour
IEEE	Institute of Electrical and Electronic Engineers
IEC	International Electrotechnical Commission