International Journal of Engineering Applied Sciences and Technology, 2023
Vol. 8, Issue 01, ISSN No. 2455-2143, Pages 289-292
Published Online May 2023 in IJEAST (http://www.ijeast.com)

TRANSMISSION LINE FAULT DETECTION SYSTEM

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Abstract: **Transmission line is the most important part of the power system. Transmission lines a principal amount of power. The requirement of power and its allegiance has grown up exponentially over the modern era, and the major role of a transmission line is to transmit electric power from the source area to the distribution network.**

The exploded between limited production and a tremendous claim has grown the focus on minimizing power losses. Losses like transmission loss and also conjecture factors as like as physical losses to various technical losses, Another thing is the primary factor it has a reactive power and voltage deviation are momentous in the long-range transmission power line.

In essentially, fault analysis is a very focusing issue in power system engineering to clear fault in short time and re-establish power system as quickly as possible on very minimum interruption. However, the fault detection that interrupts the transmission line is itself challenging task to investigate fault as well as improving the reliability of the system. The transmission line is susceptible given all parameters that connect the whole power system. This paper presents a review of transmission line fault detection.

Keywords: **LLL-G(Line-to-Line-to-Line-to-Ground), LLL (Line-to-Line-to-Line), LG (Line-to-Ground), LL (Line-to-Line)**

I. INTRODUCTION

Transmission line protection has always been a topic of major concern in the field of Electrical engineering, as it is a vital power system and is constantly exposed to the environmental conditions. It is a direct measure of a system's capability to detect, classify and locate the fault and take preventive measures to protect the remaining equipment of the power system. Transmission lines faults are an inevitable part of any power system. They cause a disruption in the power supply, which is undesirable. With an ever- increasing demand for better performance and minimal interruptions, accurate fault analysis is necessary to restore a system to its normal operation by detecting and clearing the transmission line fault

Regarding the distribution system, transmission lines perform the most important part that is to transfer electric power from the generating station to load centers. Since the development of the distribution and transmission system, power system engineers have been an object for locating and detecting faults. As long as the fault detected in short duration, it provides a good service for protecting the apparatus as well as an open way for disconnecting the part where this incident happened at fault, and with the help of this, it gives safe way to the system from any damages. So it is needed to detect the fault otherwise due to fault it causes any disturbance which further tough time to the interconnected system that based on limitations.

TYPES OF FAULT

- **Symmetrical fault**

a. line to line to line to ground fault: Line-to-Line-to-Line-to-Ground Fault (LLL-G Fault) is a type of fault that can occur in electrical power systems. In this fault scenario, three-phase conductors experience a fault where two phases short-circuit together, while the third phase makes contact with the ground. This fault condition can lead to significant electrical disturbances, pose safety risks, and potentially cause damage to power system equipment

b. line to line-to-line fault: Line-to-Line-to-Line Fault (LLL Fault) is a type of fault that can occur in three-phase electrical power systems. In this fault scenario, two of the three phases come into direct contact with each other, resulting in a short circuit. This fault condition can lead to significant electrical disturbances, equipment damage, and pose safety risks.

- **Unsymmetrical Fault**

a. Line to Ground: On a transmission line when one conductor drops to the ground or meets the neutral conductor, then there is an insulation breakdown between one of the phases and earth, due to which single line to ground fault takes place. Line-to-Ground Fault refers to a fault condition that occurs when one or more phases of an electrical power system come into contact with the ground or earth. This type of fault can result in significant electrical disturbances, equipment damage, and safety hazards.

b. Line to Line: A line-to-line fault or unsymmetrical fault occurs when two conductors are short circuited. In the figure

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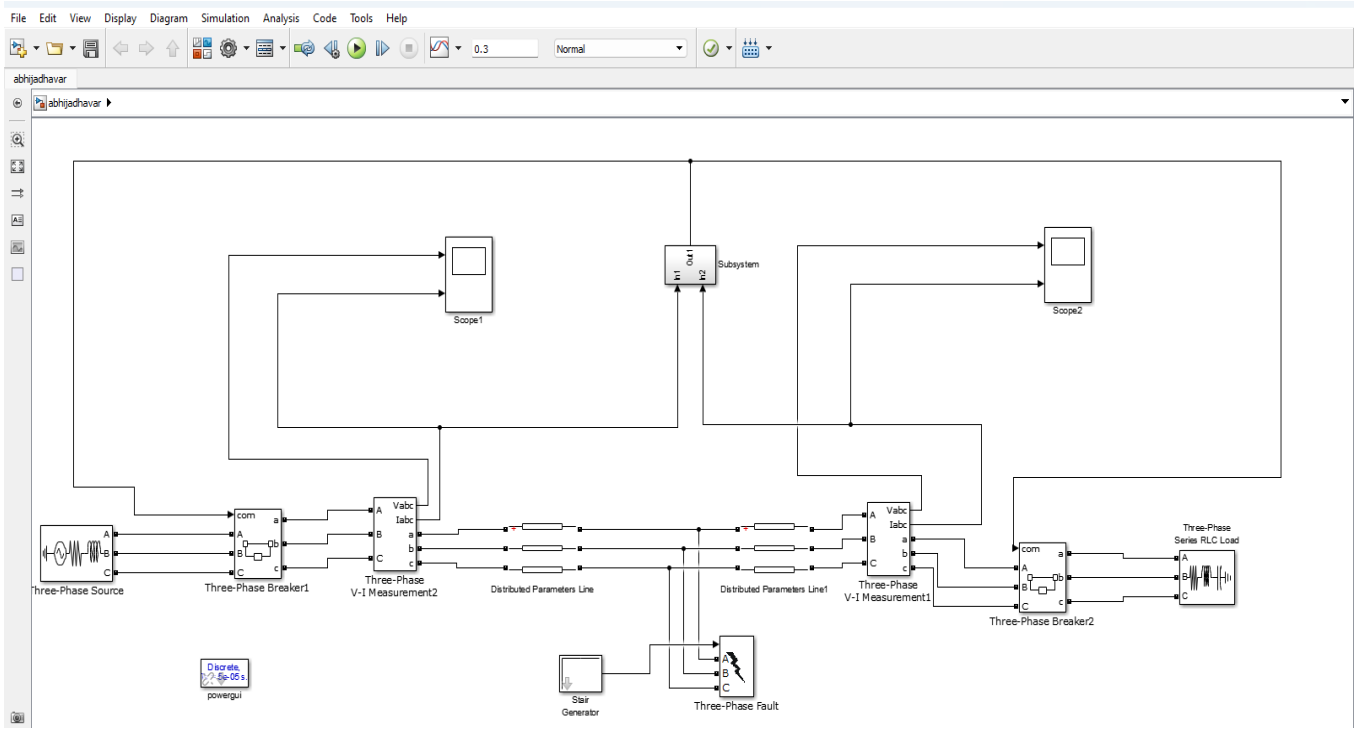
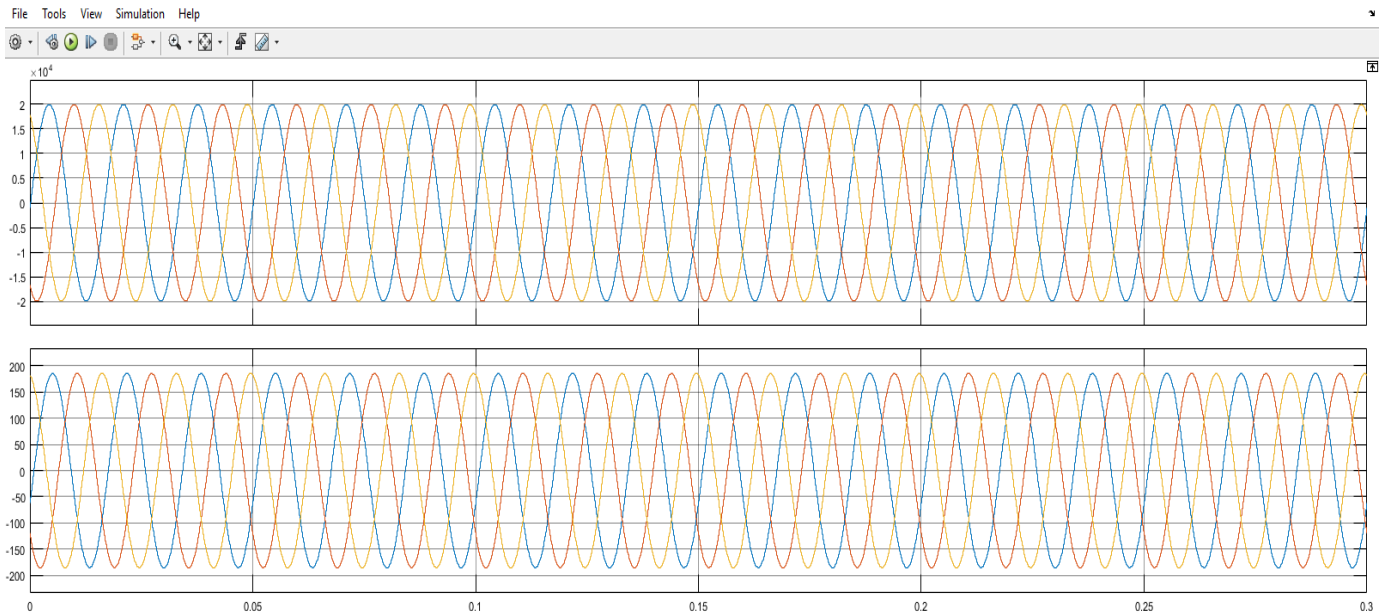
shown a three-phase system with a line-to-line fault phases b and c. The fault impedance is assumed to be Zf.

c. Double Line to Ground: A Double Line-to-Ground Fault is a fault condition that occurs when two phases of an electrical power system simultaneously come into contact with the ground or earth. This type of fault can result in severe electrical disturbances, equipment damage, and safety hazards.

MATLAB MODEL



NO FAULT CONDITION



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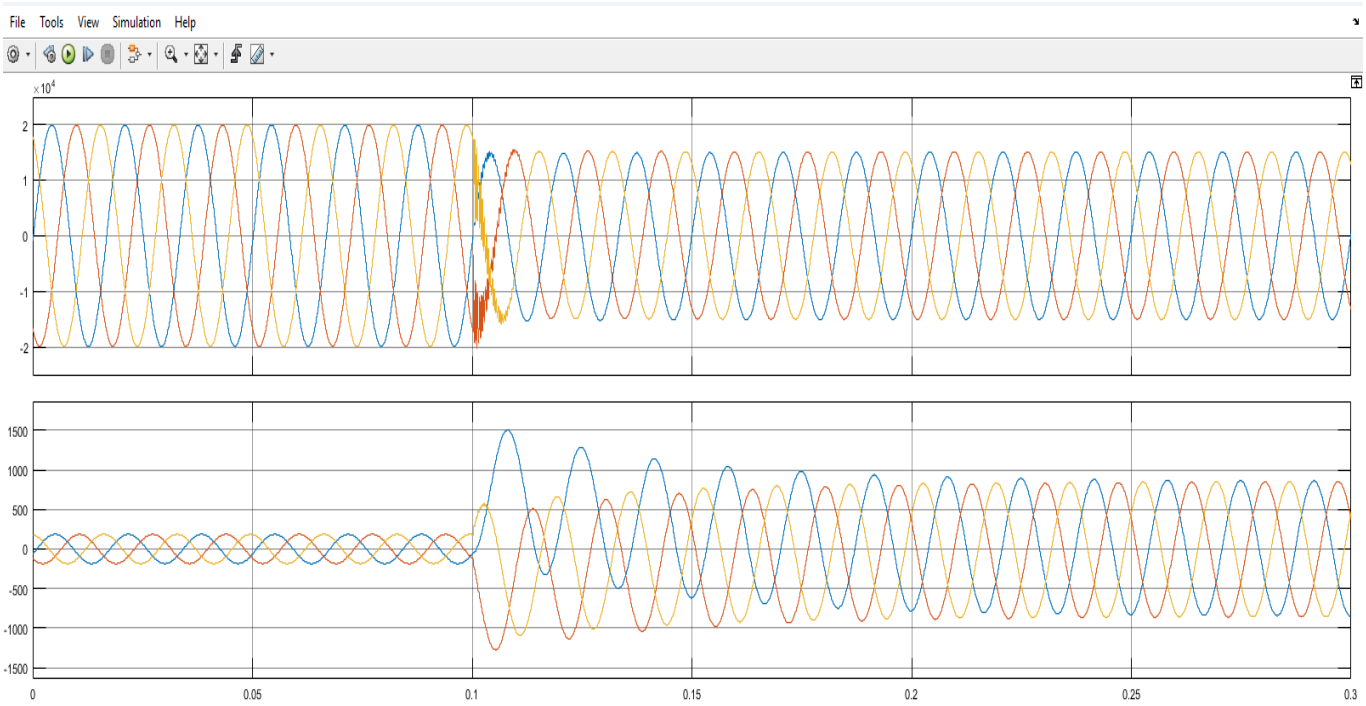
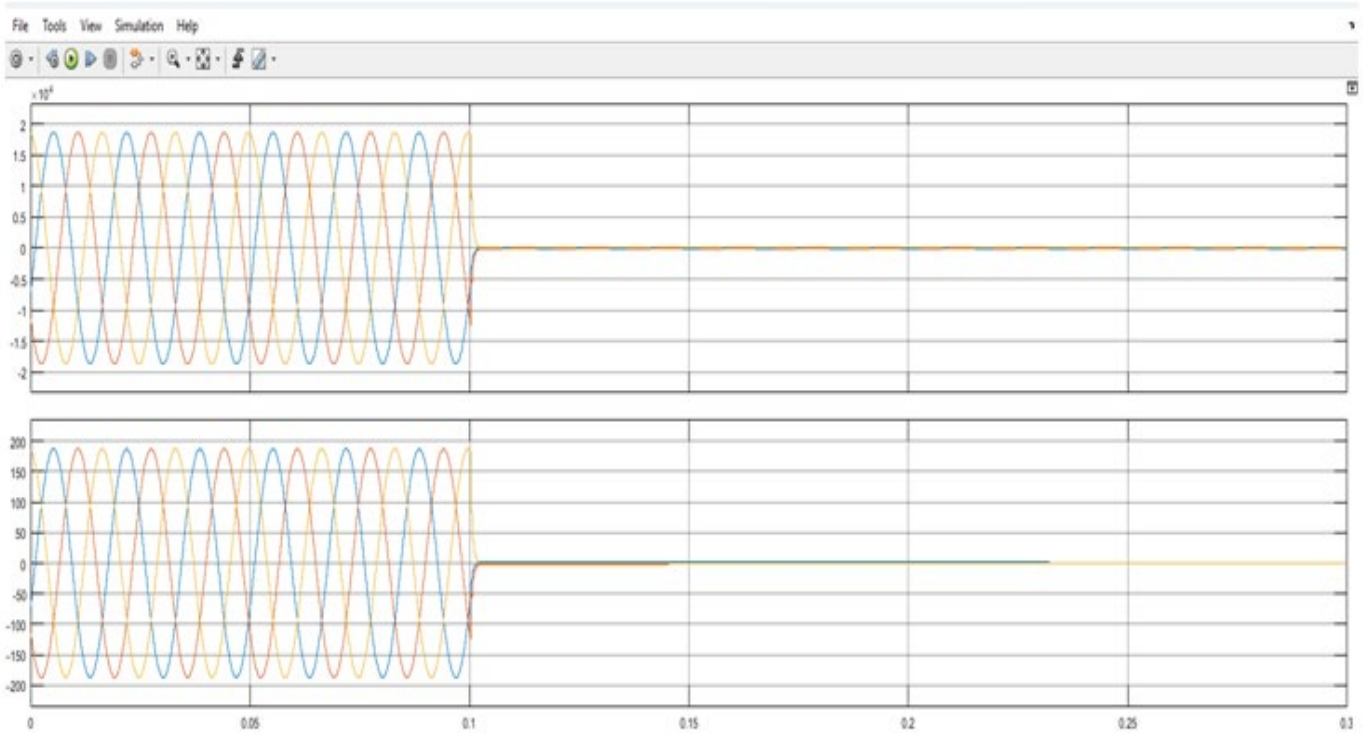
FAULTY CONDITION



RESULT:CONDITION AFTER CICUIT BREAKER OPERATE



II. CONCLUSION

In conclusion, Transmission Line Fault Detection Systems play a vital role in ensuring the reliable and safe operation of electrical power systems. These systems offer several advantages that contribute to improved system reliability, reduced downtime, enhanced safety, and cost savings. By enabling early fault detection, these systems allow for prompt intervention and minimize the impact of faults on the power system. They provide early warnings, enabling maintenance crews to quickly locate and isolate the faulty section, leading to faster restoration and reduced downtime. The implementation of fault detection systems enhances system reliability by preventing the propagation of faults and minimizing the risk of widespread power outages. By precisely locating faults, these systems facilitate targeted maintenance and repair efforts, optimizing resource allocation and reducing unnecessary maintenance expenses.
Additionally, these systems offer cost savings by minimizing downtime, reducing the duration of power outages, and avoiding financial losses associated with interrupted operations and service disruptions. By optimizing maintenance planning and resource allocation, they help utilities save on unnecessary maintenance expenses. The data generated by Transmission Line Fault Detection Systems provides valuable insights that can be used for system optimization, predictive maintenance, and future planning. By leveraging data-driven insights, utilities can make informed decisions, enhance system reliability, and improve overall operational efficiency.
In conclusion, Transmission Line Fault Detection Systems are essential tools for maintaining the reliability, safety, and efficiency of electrical power systems. Their advantages in early fault detection, improved reliability, reduced downtime, enhanced safety, cost savings, remote monitoring, and data-driven insights make them indispensable for power utilities in ensuring the smooth and resilient operation of transmission lines.

III. REFERENCE

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