

# Fault Detection in Microgrids

Do DC microgrids require advanced protection techniques for fault detection and isolation?

Abstract: DC microgrids require advanced protection techniques for fault detection and isolation(FDI). In this work,an FDI method able to respond to different types of component faults is developed based on system modeling. First,the state-space representation of a multiterminal dc microgrid with component faults is derived.

Why is data-driven fault detection a major constraint for DC microgrids?

Good robustness against measurement noises and changes in system configurations. The lack of fault data is the major constraint on data-driven fault detection and isolation schemes for DC microgrids.

Does a dc microgrid have fault-like features?

The principle of the proposed TL scheme is to extract fault-like features from normal operating data. For this reason, those operating disturbances that perturb DC microgrids in similar ways to faults are the focus of this study. In this section, the current features in a DC microgrid during a fault and such a non-fault disturbance are analyzed.

How effective is FDI method for detecting faults in DC microgrids?

The performance of the proposed FDI method is verified under the real-time (RT) simulation of a three-terminal low-voltage dc microgrid and with a small-scale laboratory dc grid. The proposed FDI method is proved to be effective to detect and isolate different faults in dc microgrids with a response time of 1 ms.

Can a deep transfer learning model detect short-circuit faults in DC microgrids?

The lack of fault data is the major constraint on data-driven fault detection and isolation schemes for DC microgrids. To solve this problem,this paper develops an adversarial-based deep transfer learning model that can detect and classify short-circuit faults in DC microgrids without using historical fault data.

How can FDI be used in a multiterminal DC microgrid?

First, the state-space representation of a multiterminal dc microgrid with component faults is derived. Then, an FDI function based on observers is designed. To achieve the desired selectivity in fault isolation, the linear matrix inequality (LMI) optimization approach is adopted in the observer design.

The existing work on sensor faults detection techniques is mainly based on additive faults, and multiplicative sensor faults are less considered. In Bansal and Sodhi ( 2018 ), sensor fault detections in a grid-connected or islanded mode DC microgrid are discussed using model-based and data-driven-based fault detection.

This paper provides an overview of islanding fault detection in microgrids. Islanding fault is a condition in which the microgrid gets disconnected from the microgrid unintentionally due to any fault in the utility grid. This paper surveys the extensive literature concerning the development of islanding fault detection techniques

which can be classified into ...

Fast dc fault detection method is required in medium-voltage dc (MVDC) microgrids to avoid severe damage to the interfacing converters. Ensuring selectivity and sensitivity of the protection system within a few milliseconds is a major challenge.

A critical review of various fault detection techniques is provided, and to categorize them based on the model based and data-driven based methods. Globally, microgrid (MG) technologies have become an important paradigm for integrating distributed resources (DR) into power systems. Growing cost, burdens associated with transmission and distribution infrastructure, and the ...

High-resistance faults in direct current (DC) microgrids are small and thus difficult to detect. Such faults may be "invisible" in that grid operation continues for a considerable time, which damages the grid. It is essential to detect and remove high-resistance faults; we present a detection method herein. First, the transient DC current during the fault is subjected ...

The lack of fault data is the major constraint on data-driven fault detection and isolation schemes for DC microgrids. To solve this problem, this paper develops an adversarial ...

DC microgrids have gained significant attention in recent years due to their potential to enhance energy efficiency, integrate renewable energy sources, and improve the resilience of power distribution systems. However, ...

In this article, we present a recursive least squares (RLS) and adaptive Kalman filter (AKF)-based state and parameter estimation (SE and PE) for series arc fault (SAF) detection and identification on dc microgrids. It is evident from the state-of-the-art research on dc SAFs that due to the lack of zero crossings and low current of the fault, the detection/identification of a ...

This paper addresses the problem of fault detection in DC microgrids in the presence of denial-of-service (DoS) attacks. To deal with the nonlinear term in DC microgrids, a Takagi-Sugeno (T-S) model is employed. In contrast to the conventional approach of utilizing current sampling data in the tradi ...

Fault detection is essential in microgrid control and operation, as it enables the system to perform fast fault isolation and recovery. The adoption of inverter-interfaced distributed generation in microgrids makes traditional fault detection schemes inappropriate due to their dependence on significant fault currents. In this paper, we devise an intelligent fault detection ...

The proposed method, which performs fault detection and classification together, just requires local information and functions effectively to discriminate faulty from normal conditions...

This study proposes a new technique based on fault launched travelling-waves (TWs) to detect, classify, and

locate different dc fault types in MVDC microgrids. Unlike the existing TW-based protection and fault location ...

This study proposes a novel protection algorithm using traveling waves (TWs) for fault detection and localization. The high-order synchrosqueezing transform (FSSTH) is applied to precisely identify TWs at the relay location. FSSTH offers a sharp time-frequency representation, enhancing the accuracy and speed of fault detection.

This paper focuses on designing a cost-effective protection system for fast identification, selective isolation of high impedance faults and system restoration in such dc microgrids through proper coordination of source converters with sectionalizers, and with no solid state circuit breakers in action. Faults in dc microgrids require quick interruption than in ...

Abstract: DC microgrids require advanced protection techniques for fault detection and isolation (FDI). In this work, an FDI method able to respond to different types of component faults is ...

The proposed model-based fault detection filter, named H<sub>1</sub>/H<sub>2</sub> based filter, and Kalman based filter can minimize disturbance effects and maximize the fault effects on the so-called residual signal in DC-MGs. Recently DC Microgrids (DC-MGs) are more attractive and effective in renewable energy resources (RERs). In this paper, for the protection of devices and ...

DC microgrids require advanced protection techniques for fault detection and isolation (FDI). In this work, an FDI method able to respond to different types of component faults is developed based ...

Microgrids Fault Detection and Protection. Systems-A Review. Noor Hussain 1,2, Mashood Nasir 1, Juan Carlos Vasquez 1 and Josep M. Guerrero 1, \*

Jayamaha, D., Lidula, N. & Rajapakse, A. D. Wavelet-multi resolution analysis based ANN architecture for fault detection and localization in DC microgrids. IEEE Access 7, 145371-145384 (2019).

The proposed FDI method is proved to be effective to detect and isolate different faults in DC microgrids with a response time of 1 ms. DC microgrids require advanced protection techniques for fault detection and isolation (FDI). In this work, an FDI method able to respond to different types of component faults is developed based on system modeling. First, ...

In this article, a fault detection and isolation technique for series arc faults in dc microgrids with multiple power electronics loads is proposed using unknown input observers ...

Due to their reliance on sizable fault currents, classic fault detection techniques are no longer suitable for microgrids that employ inverter-interfaced distributed generation. ...

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In addition, the effect of low line impedance and fault resistance may make fault detection in DC microgrids a challenge . The high amplitude of the DC fault current may damage the converters [13,14]. Another challenging issue ...

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