Definition of power system resilience

The resilience of power systems is studied generally from two perspectives including component-level and system-level. At the system-level, the resilience is measured widely in the operation time. In contrast, the resilience measurement is done before and after the event at the component-level utilizing separate indices.

This paper thoroughly examines the consensus on the power system resilience concept provided by different organizations and scholars and existing and currently practiced resilience ...

Therefore, in this paper, power system resilience is defined as the capability of a power system to maintain its performance and to speedily recover from damages after a HILF event.

One definition of reliability is a power system"s ability to deliver electricity to consumers in the desired amounts (Zappa et al., 2019). While reliability evaluation usually underlies the steady-state operation, resilience also looks over the transitions between states demonstrating the process itself .

Several natural hazards have caused unexpected problems to power systems due to climate change, emphasising the position that power systems are not prepared for extremely large-scale events. As a result, the need to study resilience in the context of power systems has been increased. A comprehensive review of the literature on power system resilience (PSR) ...

nition of resilience. Current literature on power system resilience presents many conflicting and vague descriptions. The following are the contributions of this paper: 1) The definitions of electric grid resilience in different publica-tions do not always converge [6-8]. This paper provides a unified approach to define resilience in ...

A comprehensive review of the literature on power system resilience (PSR) from various perspectives is presented herein. In this work, the first ever comprehensive definition for PSR is proposed, accounting for both ...

The concept of power system resiliency has gained significant attention as vulnerabilities and potential attacks could lead to substantial losses. This paper distinguishes power system resiliency from reliability through a detailed literature review.

This paper aims to describe and classify different high-impact rare (HR) events, provide a more technical definition of power system resilience, and discuss linkages between ...

In particular, the power system resilience definition proposed by the WG in [13] has been discussed, and how it can be applied in this situation. In addition, different types of resilience ...

In order to make the power grid more flexible and intelligent and to better withstand natural disasters, the

concept of resilience has recently been applied [2, 3]. Extreme events have the potential to cause significant power outages, making it crucial and urgent to enhance the resilience of the power system .

The definition of resilience in Ref. [8] is as follows: "the power system with resilience can resist, adapt and quickly recover from major weather/climate events and has the characteristics of ...

Recently, there has been a focus on natural and man-made disasters with a high-impact low-frequency (HILF) property in electric power systems. A power system must be built with "resilience" or the ability to withstand, adapt and recover from disasters. The resilience metrics (RMs) are tools to measure the resilience level of a power system, normally employed ...

Resilience refers to the ability of a power system, especially microgrids, to withstand disturbances and quickly recover to its normal operating conditions. This concept is crucial in ensuring that energy systems can adapt and maintain functionality in the face of challenges such as outages, extreme weather, or component failures, thus enhancing reliability and stability.

The CIGRE definition of power system resilience is achieved through a set of key actionable measures, which can only be achieved by well planned, executed human interventions to preserve and enhance power system resilience at all phases of extreme events such as the COVID-19 pandemic. To that end, the CIGRE WG C4.47 proposes to further break ...

The term resilience has increasingly been seen in the research literature [9] and popular science literature [10] due to its role in reducing the risks associated with the inevitable disruption of systems. This paper presents a comprehensive review of resilience in various disciplines, published from 2000 to April 2015. In this paper, we primarily focus on the ...

and measured; what threats the power system should be resilient to; how this term is related to, but distinct from, reliability; and what organizations are working to better define and measure resilience. Defining Power System Resilience Unlike the term "reliability", there is no formal, widely agreed upon definition of power system resilience.

Although the concept of CPPS resilience is defined in state-of-the-art research (e.g., in Ref. [8], cyber-physical resilience is defined as the system"s ability to maintain continuous electricity flow to customers given a certain load prioritization scheme), the differences between the CPPS resilience and the traditional power system resilience ...

-- Power system resilience has been an emerging hot topic in recent years to investigate the increasing threats of extreme events, such as natural disasters, severe weather, and cyberattacks . ... A. Definition of Resilience . There are many existing definitions, originating from differ-ent fields, that describe concept s concerning resilience ...

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Based on this analysis a new definition for power systems resilience has been proposed as: "the recurring ability of a power system to anticipate, survive, sustain, recover ...

Power system resilience is the ability to limit the extent, severity, and duration of system degradation following an extreme event. An integral part of the definition is the following key actionable measures; Power system resilience is achieved through a set of key actionable measures to be taken before, during, and after extreme events, such as:

The most widely accepted and used definition of energy system resilience is given by the International Energy Agency ... Mathaios et al. address this by distinguishing power systems operational resilience (indicated by share of power load served) from infrastructure resilience (indicated by share of powerlines online) [20]. However, alternative ...

While grid reliability would seem to have strong definition given the IEEE 1366 standard, grid resilience is a term that is less clear. A proper definition of resilience and the relationship between it and reliability will facilitate development of proper resilience metrics and the development of resilient grid architectures.

The concept of resilience was first introduced by Holling as a measure to determine the ability of an ecological system to absorb changes to its state and driving variables [9].Specifically, resilience is defined as a system"s ability to withstand and minimize the impact of disruptions provoked by an external event, as well as the ability of the system to satisfy or ...

Reference categorizes the high-impact events and clarifies the technical definitions of power system resilience and linkages between resilience and other concepts such as security and reliability. The resilience ...

The need to address resilience of the power system is first described in this paper. Standard definitions established for resilience are then expressed under various conditions. Through the literature review, the benefits of applying smart microgrids to improve resilience of the power system are further extracted.

Severe natural events leading to wide and intense impacts on power systems are becoming more and more frequent due to climate changes. Operators are urged to set up plans to assess the possible consequences of such events, in view of counteracting them. To this aim, the application of the resilience concept can be beneficial. The paper describes a methodology for ...

instability, uncontrolled events, cascading failures, or unanticipated loss of system components. Resilience is the ability of a system or its components to adapt to changing conditions and withstand and rapidly recover from disruptions. Security refers specifically to the ability of a system or its components to withstand

An integrated framework for jointly assessing robustness and resilience in power systems using two complementary algorithms is presented and results indicate that a network"s recovery could be related to the overload capacity of the power lines.

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Power system resilience is quantified with R t based on the areas between two curves within the starting and ending periods of an event. Performance loss as well as the degradation level of power system resilience are measured by the expression Loss and VI.

Power system resilience evaluation and enhancement meth-ods have been gaining signi?cant momentum. The term ""resilience"" in power systems has several attributes ranging from the ability of a power system to ""resist"" and ""recover"" from a disrupting event to ...

The definition of resilience for power systems should be more holistic, rigorous and dynamic than what is encompassed by the term "risk assessment". Moreover, the electric grid is a complex, large scale and physically connected system with strong interdependencies between its components. A steady supply of electricity is vital for critical ...