China microgrid digital twin

What is a microgrid digital twin?

A microgrid digital twin (MGDT) refers to the digital representation of a microgrid(MG),which mirrors the behavior of its physical counterpart by using high-fidelity models and simulation platforms as well as real-time bi-directional data exchange with the real twin.

What is electric digital twin grid?

The digital twin concept turns a new dimension of technology into the world. Electric Digital Twin grid can perform online analysis of the grid in real-timeand integrates all the past and present data and express the current grid status to the producers and consumers and also predicts the future grid status.

How DT technology can be used to build a DT microgrid?

By using DT technology to build a DT microgrid, it can analyze the evolution of key equipment and network dynamic behavior of microgrid, and predict the dynamic evolution of microgrid by digital means, which can comprehensively improve the allocation efficiency and operation status of energy resources and information resources of the power system.

Why do we need converters for microgrids?

As a result, converters are critical to developing microgrids, and, therefore, special attention must be paid to them. The use of data-driven approaches and digital twin models can solve various challenges relating to power electronic equipment, such as device faults, health conditions, remaining life, optimisation and control.

Are digital twins a stepping stone to digitalizing the electrical grid?

Recently,digital twins have been seen as a stepping stonetoward the goal of digitalizing the electrical grid.

What is a power electronic converter for a microgrid?

The power converter plays a vital role in the integration of components of the microgrid. Most of the MG's generating sources (PV,wind turbine),storage devices and loads require power electronics interfacing devices. A literature survey on power electronic converters for MGs is mentioned in [9].

The paper reviews the application of digital twins in a microgrid at electrical points where the microgrid connects or disconnects from the main distribution grid, that is, points of common coupling. Furthermore, potential applications of the digital twin in microgrids for better control, security and resilient operation and challenges faced ...

This report is part of the Computer Science series within the Atlas of the Industry research: The China Digital Twin Atlas. Digital twin technology, as a cutting-edge innovation, enables the precise mapping of physical entities in virtual space, creating a "digital twin." This technology leverages the Internet of Things (IoT) for real-time ...

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China"s plans for water management digital twins. In 2022, China"s Ministry of Water Resources announced plans for a comprehensive digital twin system for water resources management. 94 pilot digital twin programs have been established in 48 locations across the country. [5]

Microgrids can satisfy wide-ranging demands via their variable solutions, from off-grid to on-grid applications. The digital twin (DT) concept opens a new dimension in the energy system to break down data silos and carry out seamless functional processes in data analysis, modeling, simulation, and artificial intelligence (AI)-driven decision ...

Digital twin grid provides the status of the whole electric grid in real-time and intelligent decision-making capability that predicts the future of the grid and saves the power systems from tiny to large-scale accidents by both manual ...

A block diagram for achieving the digital twin of the microgrid is presented in Figure2. It can be perceived from the figure that real-time data are collected from physical entities through sensors.

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A Review on Digital Twin Technology in Smart Grid, Transportation System and Smart City: ... 2School of Electrical Engineering, Southeast University, Nanjing 210096, China 3School of Technology and Innovations, University of Vaasa ... INDEX TERMS Digital twin, machine learning, microgrid, physical twin, power system, security, trans-portation ...

Global challenges related to sustainable development are increasingly focusing on the use of digital twin technology as a universal tool for optimizing and monitoring renewable energy installations. This article discusses digital twin technology as a support for sustainable development based on the analysis of microgrid structures. Digital twins allow the creation of ...

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DT microgrid means to the virtualization of physical entities and the creation of dynamic digital twins of microgrid systems (e.g., equipment, environment, and personnel) in the digital space to achieve digital characterization, intelligent simulation, and optimal management of object properties, behaviors, and states.

Digital twin grid provides the status of the whole electric grid in real-time and intelligent decision-making capability that predicts the future of the grid and saves the power ...

We have developed a Deakin Microgrid Digital Twin with various AI powered functionalities for the Microgrid. Deakin Microgrid Digital Twin (DMDT) is a web-based software developed in-house for research and operation management purposes. Applications being developed include: health monitoring (performance evaluation), anomaly detection ...

The ANGEL Digital Twin for Cyber-Physical System Security is a novel approach for improving the security of critical and non-critical infrastructure. Digital Twin technology, widely used in the aviation, manufacturing and automotive industries, has the potential to improve the security and resiliency of the microgrid. In this paper, we present a framework for adapting the Digital Twin ...

This digital representation is designed to accurately mirror the behavior and performance of the actual microgrid clusters in real-time. Digital twin is a key component that enables us to perform comprehensive simulations and analyses, which are critical for enhancing fault diagnosis, predictive maintenance, and strategic decision-making within ...

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In this paper, an experimental microgrid in Singapore is selected as the real twin and a digital twin is created. The digital twin is built using a hardware-controller-in-the-loop real-time simulation (HCILRTS) design. The development and validation process of ...

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M. Jafari et al.: Review on Digital Twin Technology in Smart Grid, Transportation System and Smart City: Challenges and Future by applying platforms and two ways interactions of data in real-time. In early of 2012, the first technical paper was released for DT by National Aeronautical Space Adminis-tration (NASA) [2].

The primary aim of DT is ...

This paper presents a digital twin microgrid architecture for real-time monitoring and decision-making in opportunistic maintenance. Meanwhile, this paper introduces a risk importance measure to aid to optimize opportunistic maintenance strategies when resources are limited.

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A real-time digital simulator (RTDS) is used to build a grid-level digital twin microgrid to digitally reproduce the equipment, environment and other key aspects of the physical grid. A digital twin framework for power equipment is proposed to provide a systematic structural support for the digital management of microgrid power equipment.

A digital twin saves microgrid owners time and money by allowing them to learn from the past, understand the present and better predict the future, according to John Francis, vice president of business development and marketing at ETAP.

Prior to the construction of MGs, the presence of a microgrid digital twin (MGDT) allowed designers to optimize their designs and assess the outcomes of their choices in a cost-effective and low-risk setting. ... Peng Y. Zhang X. Song Y. Liu D. 2019 5 1 2019/05/01 China A low cost flexible digital twin platform for spacecraft lithium-ion ...

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