Microgrid Cyber-Physical Systems

What is a cyber-physical microgrid?

In cyber-physical microgrids, the communication network, IoT devices and service applications, and mobile and remotely accessible tools are key targets for potential attackers. For example, adversaries might gain access to internet-connected devices, such as programmable logic controllers used in DERs or power grids.

What is a microgrid?

Microgrids (MGs) represent one outcome of this transformation. The MG represent a compact power systemcomprising of independent renewable energy resources (RERs),energy storage systems (ESSs),and loads operating as a unified control system to generate power for localized areas within the range of 10-100 MW [3,4].

Are microgrids vulnerable to cyberattacks?

The reliance on network communication makes microgrids more susceptibleto malicious attacks. Cyberattacks can target various components of microgrids,including DERs,the communication network and control systems,disrupting grid operations,stability and even causing physical damage.

Are microgrids Compact Power Systems?

The concept of microgrids (MGs) as compact power systems,incorporating distributed energy resources,generating units,storage systems,and loads,is widely acknowledged in the research community. G...

The cyber-physical interdependence analysis was considered in [49, 50] by investigating the correlation between the control system performance and communication QoS for an islanded AC ...

In an islanded mode, control of a microgrid relies on the communication system significantly. Hence, microgrids are cyber-physical systems and, therefore, the cyber system plays a ...

MG systems are typical example of complex, networked, cyber-physical systems characterized by heavy transmission and communication between different components of a ...

To fully reveal the interplay of the cyber system and physical system in the microgrid, this paper proposes a generic hierarchical modeling framework for cyber-physical integration modeling of ...

Due to their complexity and inter-connectivity, MGs are increasingly vulnerable to a range of cyber-attacks that can compromise system stability, reliability, and safety. This paper presents an ...

The cyber-physical microgrid is facilitated by the power Internet of Things, which synchronizes data, control and communication processes at the cyber level with energy flow at the ...

Microgrids are increasingly being adopted in distribution systems to maintain operation of electrical systems in adverse situations, such as storms or cyber attacks. Modern microgrids rely on ...

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This textbook provides students with an overview of cyber-physical microgrid networks and an in-depth introduction to photovoltaics, batteries, flywheel, supercapacitor, micro-turbines, wind generation, ...

Denial-of-service (DOS) in microgrid-based network system has high probable cyber threat where system stability is challenged by the interruption in the communication on control signal ...

However, with the rapid evolution and increasing complexity of energy and power system formation (distributed resources, gas, heat, cooling, electric vehicle, mobile storage, etc.), new approaches and ...

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