

# *A Survey of Control Strategies Applied in Worldwide Microgrid Projects*

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**Abstract** – A growing amount of distributed energy resources are integrated into the medium and low voltage level. This does not only bring a series of benefits, but also causes severe problems in power systems. The technologies of microgrids, including their architecture, distributed generation, storage, and control schemes, are widely researched across the globe, because of the increasing requirement of power quality and reliability and security of energy systems. This paper, focused on the technologies of operation systems and available control approaches, illustrates the review of diverse research projects and activities of microgrids around the world. It presents existing microgrid projects in Europe, America and Asia. It also illustrates the current state of control strategies and the correlation between volatile distributed generation and storage systems, and between loads and storage systems.

## **1. Introduction**

To improve the reliability and security of electrical power systems and the power quality, as well as to decrease greenhouse gas emissions, the concept of microgrids (MG) has been introduced. The MG is a decentralized electricity network comprising distributed generators (DG), such as wind, photovoltaic (PV), biomass and diesel generation, local loads, and energy storage systems that can operate in grid-connected or island mode.

The most compelling characteristic of a MG is that it has the possibility to separate itself from the utility network when faults occur either in the overall grid or in the local network, and when the fault is cleared, the MG can reconnect to the utility grid. Distributed power generators are typically located closer to the side of consumers than centralized power plants. The energy then can be generated and stored near the consumption points, which can improve the stability and reduce the losses caused by large power lines [1].

## **2. State-of-the-art**

While an increasing amount of distributed energy resources (DERs), i.e. decentralized generation capacity and decentralized energy storage, are integrated into overall grids, it is important to develop a safe and efficient control technique for the MGs operation. The control strategies of MGs face a series of challenges. This section introduces some existing control strategies.

