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Green Energy 2020: Fault Protection and Dynamic Control Strategy for Microgrids with High Renewable Energy Penetration, China- Dehua （David ） Zheng- Goldwind Science and Technology Co., Ltd

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Introduction

Microgrid is a group of interconnected loads and distributed energy resources (including microturbines, diesel generators, energy storage, renewable resources, and all other kinds of distributed energy resources) at distribution level with defined electrical boundaries that has black start capacity and can operate in island mode and/or grid-connected mode.

Because of the uncertainty, intermittent, and discontinuity of the renewable resources, transient disturbance and dynamic disturbance exist in the microgrid. For the fault current is small in the system and the microgrid has very little inertia, the disturbance control and fault protection of microgrids are more difficult than the ones of traditional grids.

The most challenging part of protection and dynamic control of microgrids is figuring out whether a fault or disturbance is occurring in the system. In the microgrid, there may appear transient characteristics similar to the transient and dynamic disturbance at the initial faults. If there is a fault, the transient disturbance control should be used to prevent the system from collapsing and make sure the right breakers should be tripped. But if there are transient and dynamic disturbances, even the initial characteristics of the transient and dynamic are very similar to the fault ones, the breakers should not be tripped.

So that Mr. Zheng has been leading his team to propose and develop the dynamic disturbance control, transient disturbance control and fault protection technologies, and they all have been well applied in practical projects. The main innovations are as follows:

(1) Relying on the dynamic disturbance control technology of the energy storage system, it can achieve safe and stable operation under the condition of high permeability of renewable energy, and can support 100% consumption of renewable energy generation in microgrid system.

(2) Through real-time load and power generation monitoring, analysis and control technology, relying on power and energy storage energy to effectively suppress transient disturbances and dynamic disturbances, respectively, to achieve unplanned seamless switching from grid connected mode to island mode or vice versa (time less than 10 milliseconds), Improve the safe and stable operation level of the system.

(3) Based on the Park transformation and the fault identification technology of branch current and voltage harmonic rapid changing rate, the precise positioning and fast isolation of the fault components of the microgrid are realized.

(4) Based on the power and load side comprehensive treatment technology, the total harmonic distortion rate (THD) of voltage and current is less than 3% when operating on an island.

The microgrid dynamic disturbance control technology, transient disturbance control technology and fault protection technology have been evaluated by domestic and foreign experts as reaching the international leading level.

The dynamic security issue is one of the most basic issues, which face the force framework architects. Dynamic security alludes to the capacity of the electrical force framework to keep up the synchronism when exposed to a cut off trainset unsettling influence. In this way, the dynamic security manages unsettling influences that force pivotal changes into the framework factors. Among these are short out flaws, loss of a predominant age source, and loss of a huge burden. The framework reaction to these aggravations remembers huge deviations for the framework factors, for example, voltage extents and edges, generator speed, and framework recurrence. Subsequently, the harmony between the information mechanical force and the yield electrical force is upset. And afterward, the confound makes the coordinated generators (SGs) either quicken or decelerate.

Then again, saving unique security is diverse between the mass force frameworks and MGs. On account of the mass force frameworks, the customary simultaneous generators are viewed as the wellspring of the elements. Moreover, in MGs, the RESs are the host of elements. In addition, the greater part of the accessible strategies for saving the dynamic security of the mass force frameworks are viewed as wasteful for MGs because of these techniques are conceived dependent on the highlights of the mass force framework, which are critical inactivity consistent and rather moderate elements. Subsequently, this exploration examines the dynamic security issue in the microgrids. In the MGs, the RESs trade capacity to

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the MGs through inverters/converters. The force electronic interface-based RESs are static gadgets with no turning mass so the related inactivity steady is about zero.

Microgrid framework:

The MG is a little force framework, which comprised of Distributed Generators (DGs), local burdens, vitality stockpiling frameworks (EES), and force molding units. The MG is dispersed through low voltage appropriation frameworks and the electric force is primarily created by DGs, for example, photovoltaic (PV), wind turbines (WT), hydropower plant, power devices, and so on. This exploration centers around the islanded MG, which incorporates 20 MW of Thermal force plants, 6 MW of a breeze ranch, 4.5 MW of a sun based homestead, and 15 MW of household loads. The streamlined model of an islanded MG with impact of the proposed coordination

Keywords: Smart microgrid; Microgrid protection and control technology; Renewable energy.