Book 7
Technical Specification and Requirements of Protection System

Technical Specification and Requirements for Protection System In Microgrid Development Project at Mae Sariang District Provincial Electricity Authority

1. Introduction

This Technical Specification presents the protection system in the bidding document of Microgrid Development Project at Mae Sariang District, Mae Hongson. The protection system is one critical part of microgrid project. This document specifies the necessary details of protection system of MGDP**.**

The protection relays equipment used for 22kV MSR substation are Schneider Micom P143 (Incoming1, Bus Section, Outgoing 1-10, Capacitor Bank1) and Micom P142 (Station Service1, 2). While the CSCS is Timpano product. The protection relays using has 115 kV in MSR substation is Schneider Micom P94VP (Synchronizing Check Relay for Manual Close 115 kV CB). The final details will be confirmed after contract awarded.

2. Principal Requirement

Protection setting in microgrid is usually different from that in traditional radial distribution system. The looped or meshed network of microgrids will affect fault current magnitude and direction, in both grid-connected microgrid and islanding microgrid, the protection setting should be modified to adapt to their specific topology. Integration of microgrid shall not interfere with the safe, secure and reliable operation of the distribution system. When the protection for microgrid connection to distribution system is being designed, the envisioned protection schemes should be coordinated with the existing protections in distribution system. Connected microgrid can either act as load or energy resource, so when microgrid is connected through dedicated line to distribution system, protection of the dedicated connection line should be set according to the principle of bilateral power protection configuration.

Grid-connected and isolated microgrids shall have the corresponding protective relaying functions to prevent equipment damage and guarantee safe operation. When microgrid transfers from grid-connected mode to island mode, the configuration, power flow, neutral grounding and short-circuit current values will change. Therefore, the microgrid protection setting value shall be reconfigured accordingly. In connected microgrid, the fault current differs between grid-connected mode and islanding mode. In the grid-connected mode, fault current is larger because it is contributed both from the distribution system and the DER in microgrid; in islanding mode, fault current is only provided by DER. While the output current of converter-based DER is usually confined to 1.5-2 rated current, therefore, fault current is much smaller. However, the protection system in MGDP shall have at least 4 operation modes, which are included grid-connected mode, islanding mode with only battery energy storage, islanding mode with only diesel engines, and islanding mode with both battery energy storage and diesel engines. In addition, the operation time of relay shall be complied with PEA protection standards.

Therefore, the requirement of protection system as following:

1) The contractor shall provide power system study for both 22kV and 115kV power source such as short circuit study, power flow study, protection scheme design, dynamic study, designed and engineer report for setting protective relay as microgrid operation in 4 operation modes in MGDP area for PEA approval.

2) The contractor shall modify the protection system to cover all switchgears and also provide relay setting group operation and synchronizing condition for 115kV and 22kV protective relay system according to at least 4 scenario operations (grid-connected mode, islanding mode with only battery energy storage, islanding mode with only diesel engines, and islanding mode with both battery energy storage and diesel engines).
3) The contractor shall provide the display of active group of working relay in order to check the grouping of relay.
4) The contractor shall supply all necessary devices or materials and perform all necessary fabrication, testing, wiring, and interconnection work during the process of assembling and connecting to microgrid controller.
5) Protection System operation event and communication status between protection relay and MGC shall be monitored in microgrid controller system.
6) The contractor shall supply tools for communication between MGC and CSCS in order to be able to change automatically group of working relay and send alarm signals through CSCS.
7) The contractor shall provide site acceptance testing (SAT) for every modes of operation of protection system for microgrid system. SAT shall include the test sets in order to demonstrate the readiness of the protection system.