Book 5

Technical Specification and Requirements of DG Integration

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Technical Specification and Requirements of DG Integration for Microgrid Development Project at Betong District, Yala Province Provincial Electricity Authority (PEA)

Introduction

This Technical Specification presents the DG integration in the bidding document of Microgrid Development Project at Betong District, Yala. The DG that already installed in the power system compose of PEA diesel engine and private VSPP. This document specifies the necessary details of modification of diesel engine and how to integrate with private VSPP. The necessary parameter, e.g. active and reactive power and current and others, from both DG shall be monitored by the MGC. The MGC shall be able to fully control the PEA diesel engine and STATCOM/SVG. While the private VSPP would just be controlled to ON/OFF by the MGC via SW.

1 Modification of Diesel Engine

1.1 Scope

This section define the requirements for modified diesel engine within the scope of MGBT. The document defines the following aspects

- Upgrade System & Test for Functionalities and interface requirements of diesel generator.
- Provide Preheating system and test for diesel generator

1.2 Principal Requirement

1.2.1 Interface of diesel generator controller

Currently, there are 7 units of diesel generator have been used at Betong area, beside Yupparachun Substation. These diesel generators will be used as power supply during long interruption, and used as voltage regulation during heavy load. The diesel generators are consisted of 7 of 1 MW of Cummins. Each of the Cummins diesel generators is connected to one 1.25 MVA, 0.4/33 kV step-up transformer. Each diesel generators is controlled by individual controller, DSE8610, detailed in Appendix A. In addition, all 7 individual DSE8610 will be controlled by master controller DSE8660, detailed in Appendix B.

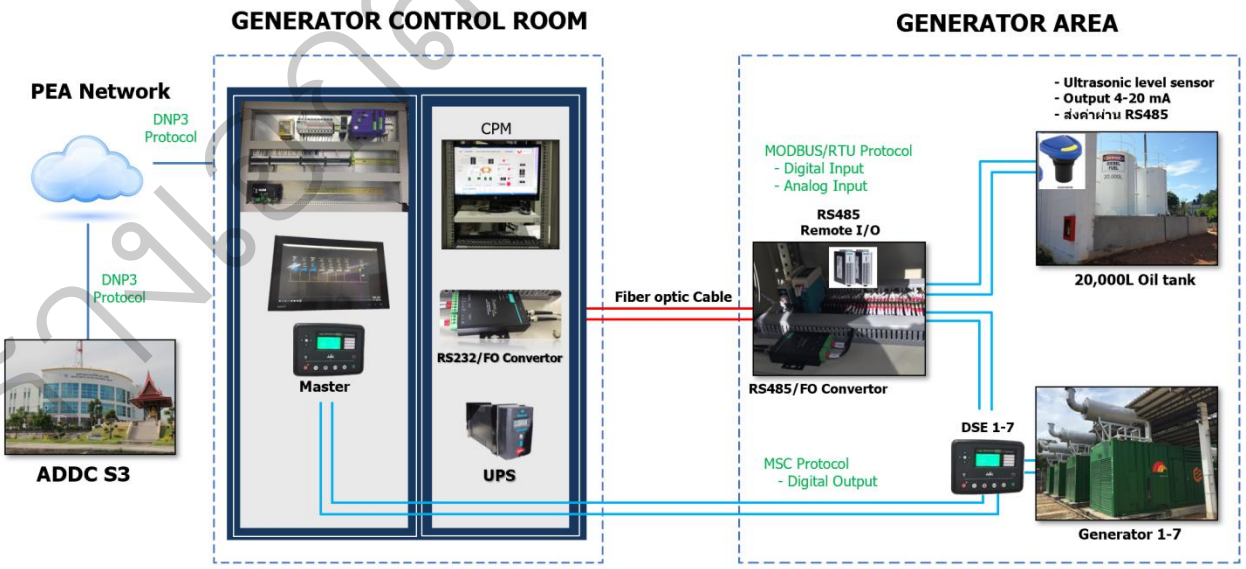
Diesel generators system is controlled by ADDC S3 via PEA Network through CPM. CPM is connected to master controller (DSE8660) and DSE8610 via RS232 and Modbus TCP/IP protocol respectively. It can control Start/Stop and monitor all 7 diesel generators. The configuration and connection of diesel generator with transformer and controller is shown in Fig. 1.

Contractor shall upgrade the existing diesel generator control system to be able to operate and monitor every needed functions for microgrid system. (Without interfering with existing remote controllers, CPM and ancillary equipment). If the upgraded system needs to add additional devices, the contractor shall provide the ancillary equipment for supporting the upgraded system completely. For example, If the controller have to do peak shaving and the diesel generator system have to install the current transformer (CT) in order to complete the function, the contactor will be in charge of the cost of equipment and installation.

Diesel generators shall be controlled and monitored by ADDC S3 via DNP3.0 over IP with Authentication Version 5 (Without using existing remote controllers). Contractor shall redesign the diesel generator system in order to do the functions while MGCs in operation and MGCs failed. During MGCs nonfunction or failed, ADDC S3 shall control and monitor the diesel generator system via DNP3.0 over IP with different communication network of existing remote controllers. Leastwise the capability of diesel generator system for controlling and monitoring shall perform as same as the existing remote control system. (Detail in Appendix C).

Diesel generators are controlled by MGC through DSE8660 only. The microgrid controller can connect to master controller DSE8660 via RS232, RS485 or Ethernet. PEA not allow MGC system to connect directly to DSE8610. If modification of connection between DSE8660 and DSE8610 is required, it will be under responsibility of the contractor.

Any actions that related and affected to the legacy system, shall be discussed with PEA before proceeding.



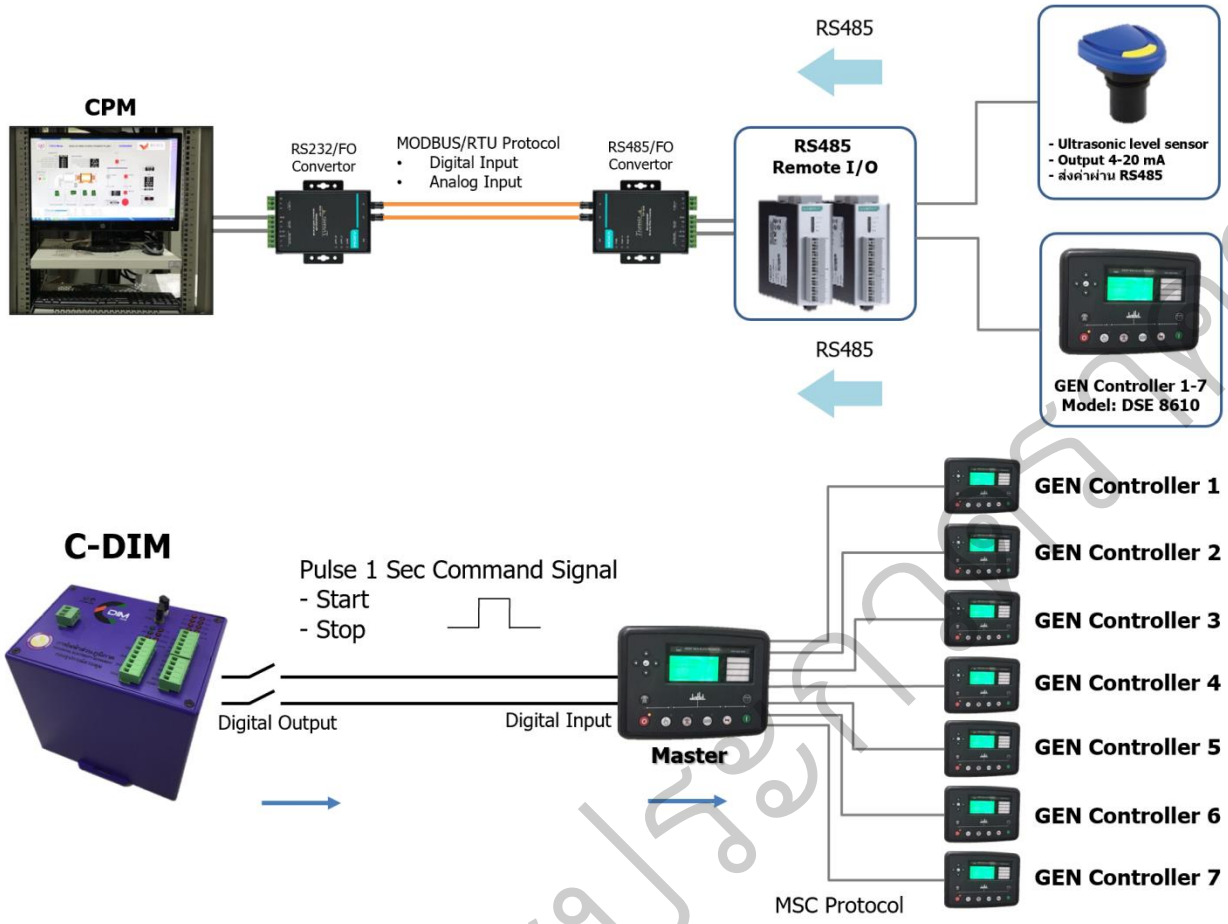


Figure 1: Existing configuration of diesel generator at Betong.

The microgrid controller shall be able to display and monitor all 7 diesel generators on the display of microgrid controller screen. The contractor shall provide and make connection of power cable, control cable and communication cable between YRA substation, microgrid control center building, and diesel generator area.

1.2.2 Preheating system for diesel generator

One objective of MGBT is to improve reliability of system. However, these diesel generators cannot delivery power instantaneously due to diesel engines are starting from idle status. There will take time at least 5 minutes to be ready for delivery power. They can be retrofitted with preheating system that can make these diesel generators to be ready within one minute. Therefore, the MGBT will have diesel generators as available source during interruption or when there are needed. The rating of delivery power of diesel generators is about 70% of its rating depended on working condition of generator (temperature, lubricated oil, etc.). However, it can delivery power up to 80-85% for short period of time.

The contractor shall provide preheating system to all diesel generators at Betong area. The preheating system will be needed it for easy engine starts and also immediate full power within one minute. The contractor has to propose the preheating system to PEA for approval.

2 VSPP Integration

To integrate the private VSPP to microgrid system, two parts of system shall be installed.

2.1 Static Var Compensator (STATCOM) or Static Var Generator (SVG)

To utilize the private VSPP, the contractor shall provide containerize (+/- 6 MVar) STATCOM/SVG air cooling system and ancillary system with foundation and fence at the private VSPP area. PEA will inform the location to install later. Total area to install the whole containerize system (STATCOM/SVG with reactor and other accessories are in container) is about 15×15 meters, including 2 sets of the container with 40 feet container's size. For outdoor container, the protection class shall be at least IP54. The steel structure and other metallic material shall have corrosion protection. The surrounding area shall be monitored by security camera system, including a digital video recorder, and etc.

Technical requirement for STATCOM/SVG

Item	Description	Detail	Unit/Meaning	Note/Condition
1	Rated	+/- 6	MVar	
2	Power losses	less than 2%	of rated	full load capacitive to full load inductive
3	Response time	less than 40	ms	suddenly increase 10% of rated current to 90% of rated current and suddenly decrease 90% of rated current to 10% of rated current
4	Over load capability	more than 15%	of rated for 1 hour	
4	Total Harmonic Distortion (current) THDi	less than 3%		at rated
5	Output reactive power control	Less than 2%		Between reactive output and setting value

2.2 Monitoring and control system to MGC

Monitoring system of necessary parameters to MGC from private VSPP and STATCOM/SVG compose of active and reactive power and current and others that will be discussed later. The private VSPP would just be controlled to ON/OFF by the MGC via SW. STATCOM/SVG would be local controlled and shall be able to get the setting point from MGC.

2.3. Spare Part Recommendations

STATCOM/SVG major equipment and special tools with recommended spare parts (Breakdown in price schedule of each items).

Appendix

Appendix 5.A

Details of individual diesel generator controller, model DSE8610

Appendix 5.B

Details of master controller of diesel generator, model DSE8660

Appendix 5.C

Details of control and monitor data of diesel generator, when use CPM.

Appendix 5.D

Details of located area of STATCOM/SVG.