Paris Session 2022





Experience in Studying Implementation of IEC 61850-based PAC System using Analog Power System Analysis Simulator

SC B5 PS2 Q2.05

What are the experiences to improve the practical application and verification of the protection in a real substation project? Yoshifumi FUKUYA (JAPAN)

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Group Discussion Meeting

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Analog Power System Analysis Simulator

•Simulator that simulates Real Power System can implement the PAC equipment.

•Rated Analog Main Circuit : 50V-62.5mA

•Primary Voltage and Current Ratings are Different from Real Power System.

•Simulator can Simulate Real Power System Conditions by Properly Interconnecting Each Model.

•PAC equipment (MU, IED) for Real Power Systems can be Implemented in this Simulator by Modifying Voltage / Current converter.

Transmission Line Transmission Line Power Station Substation Substation Load Fault Thermal System Power Plant General Consumers Real Power Transmission Transmission Distributing Substation Wind Line Line Substation Power Plant Average Scale Solar _arge Power Plant Commercial Facilities Plant Syste Simulator Transmission Transformer Mode Line Model Transformer Model Transmission Multifunction Line Model Load Model Multifunction Multifunction Fault Generator Model CB Model Load Model 2 © CIGRE 2022

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PAC Equipment (MUs and IEDs)

• Functions of IED for Measurement(191 units)

- Analog Main Circuit Measurement.
- Internal Data Measurement of Generator Model.
- Open/Close Control of CB Model.
- Transformer Tap Control.
- Function of Protective MU (34 units)
- Converts Primary-side AC Values to Digital Data with 3,75 Degree Electrical Angle Sampling.
- Transferred to IED as SV Data.
- Functions of Protective IED (3 units)
- Execution of Various Protective Function
 Operations using SV Data from Protective MU.
- Transmission of Trip Commands from Protective IED to CB Model IED via GOOSE Communication.
- Various Protective Functions: Relay Elements used in Real Power System.

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Time Synchronization System

- All 228 units use Time Synchronization Master(GMC) and Time Synchronization (using IEC 61588-PTP)
- Time Synchronization Accuracy is within 1 MicroSecond.
- IED for Measurement and MU for Protection are Sampling Synchronized Starting from Time Synchronization Timing of Every Second.
- All Digital Data in Simulator are All Sampling-Synchronized Data.
- Characteristics of Communication SW adopted for SV Communication between Protective MU and IED.
- Sampling Synchronization Discrepancies
- Missing Data
- Retention Occur
- Problem : Communication Network Configuration or in Distribution of Amount of Communication Data through each SW.
- This experience has shown that Characteristics of SW for SV Data must be determined with Highest Priority. Group Discussion Meeting

