NAME :
COUNTRY : Thailand
REGISTRATION NUMBER : 6904

GROUP REF. : SC B3
PREF. SUBJECT : Integration of Intelligence on Substations (joint PS with B5
QUESTION N° : PS3.5

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What are your expected benefits of using digital substation concepts?
Ans. This paper offers the idea of integration of 22 kV switchgears of which the control and protection system is designed based on the basis of IEC 61850 with the existing conventional substation. The switchgears are implemented for Battery Energy Storage System (BESS). The expected benefits of applying the concept of digital substation are considered in terms of cost reduction from diminish of copper cables and devices, decrease of installation area from disappearance of some devices and time saving of design, maintenance, installation of control and protection system. These benefits from our successful pilot project bring to the idea of integration conventional substations with additional new feeders for energy storage systems or normal case which is widely widespread in the future.

How to measure if the benefits can be realized?
Ans. The pilot project is completely finished, and the benefits of this project can be evidently measured in term of cost reduction, and time saving comparing with addition control and protection system of new feeders by conventional method. The methods of benefit measurement are listed below.

1. Comparing the cost of copper cables and wiring. In this project, the reduced cost of copper cables which connect between switch yard equipment including Intelligent Electronic Devices (IEDs) and the existing control and protection building or between each IEDs with conventional concept can be shown in Table 1.

	Equipment Description	Conventional Sub.	Semi-fully digital Sub.	
	Copper Cable	$63,000	$2,000	
	Optical Fiber		$1,500	
Estimate Price (USD)		$63,000	$3,500	
Price Diffrence (USD)				$59,500

Table 1: Estimated price of copper cables for conventional substation and optical fibers for semi-fully digital substation applied for BESS project

2. Analysis the deduction cost from equipment and related panels. In this project, the marshaling RTU panel and RTU system are replaced with the GATEWAY device which acts as a protocol converter. Moreover, there is no need to install auxiliary relays which are used for Closing/Tripping CB and DS via RTU command. Furthermore, the TDRs and their panel are no longer required because their functions can be performed by the IEDs. The details of equipment cost which are calculated on the basis of EGAT's medium price and manufacture price are shown in Table 2.

	Equipment Description		
	Conventional Substation	Semi-fully digital Substation	
	1XMarshalling Panel for RTU	1XGateway	
	1XRTU System with Panel -64 Analog Input -128 Digital Output -384 Digital Input	2XOptical Interfacing Panel and Accessories	
	Transducers with Panel		
	Auxilary Relays for control CB,DS,ES with Panel		
Estimated Price (USD)	$37,000	$12,500	
Price Diffrence (USD)			$24,500

Table 2: Estimated price of equipment for conventional substation and semi-fully digital substation applied for BESS.

3. Measurement the budget and time saving for engineering design. According to our database, approximately 70 man-hours are reduced in this project due to the fact that schematics and wiring diagrams are represented with programing to IEDs.

4. Studying installation cost, maintenance cost, including installation area of IEC 61850 method and compare with conventional concept