

Study Committee B3

Substations and Electrical Installations

Paper ID_11000

Challenges and experiences on renovation of EGAT's conventional substation to IEC 61850 based digital substation

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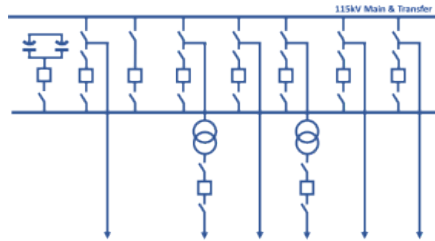
For more info

Motivation

- Higher penetration of Distributed Generator (DG) according to the Power Development Plan 2018 of Thailand
- Communication infrastructure is required to support smart grid
- IEC 61850 based digital substation allows interoperability

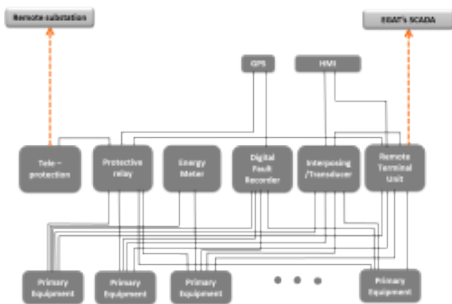
Scope of the project

- Brownfield substation
- Renovation on secondary equipment
- 115 kV Main & transfer air-insulated substation
 - 115kV feeder: 4 feeders
 - 115/22kV transfer feeder: 2 feeders
 - 115kV capacitor bank: 1 feeders

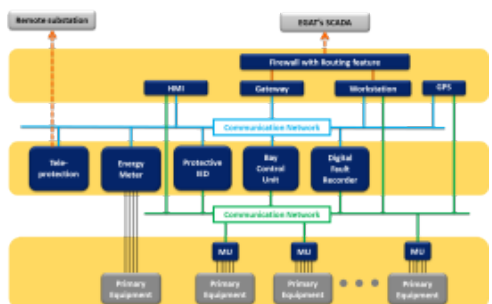


Topology

Conventional substation

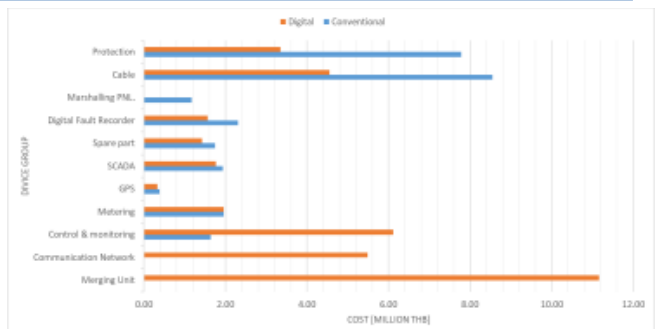


Digital substation



Cost comparison

- Secondary equipment is considered
- Total cost
 - Conventional substation: 27.45M THB
 - Digital substation: 37.68M THB
- Digital requires 36% more CAPEX



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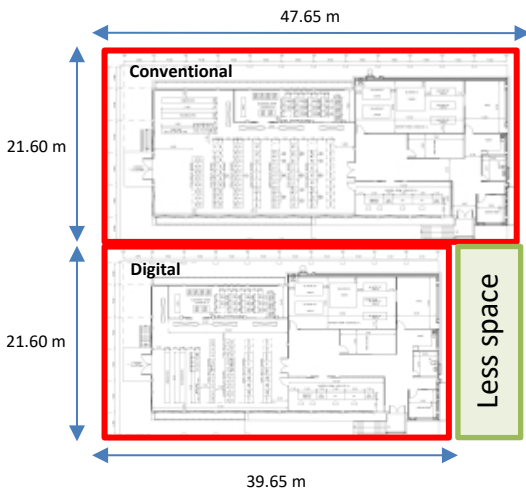
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Compensation for higher Cost

- Less panel is required due to more compact design using multi-function IEDs
- For greenfield substation, the control building can be redesigned.
- Generic layouts of control building are taken into comparison.

16.79% space reduction

9.50M THB decrease in building construction cost

More Benefits

- Shorter construction and installation time (= lower cost)
- Support further applications
 - Unmanned substation
 - Substation monitoring system (asset management)

Challenges

- Changes in work process and responsibilities as well
- Outdoor merging unit cubicle must be taken very carefully, especially in tropical country which has temperature and humidity concern.
- Hybrid design would cause complication and over-investment.

Conclusion

- Cost
 - Secondary equipment cost is higher in digital substation. 36% for this case!
 - For greenfield project, overall CAPEX of digital substation tends to be less.
- Available for furthermore applications, e.g., unmanned substation, asset management
- Work process needs to be reconsidered. Reskill is necessary.